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(54) Machine for packaging box-like items, such as cigarettes, by means of a packaging sheet.

(57) A packaging device in which a thermoplastic packaging sheet is supplied to a peripheral part of an opening of a pocket (3c) of a winding wheel (3) while box-like item (A) transported into the pocket is being continuously transferred, the box-like item is transported out of the pocket and delivered thereby the packaging sheet (B) is wound in a U-shape along the surface of the box-like item (A), and both free ends of the packaging sheet are folded along the surface of the box-like item while the delivered box-like item being continuously transferred and then overlapped to each other to be thermally adhered to each other, characterized in that an applying wheel (4) continuously rotated synchronously in a direction opposite to a rotating direction of said winding wheel (3) is disposed in parallel on a downstream side of said winding wheel, each of an outer circumference of the winding wheel (3) add an outer circumference of the applying wheel (4) is provided with a plurality of pockets (4c) having the box-like items transported therein is equal-spaced part in a rotational direction and oscillatably, the winding wheel and the applying wheel are continuously rotated in synchronous manner in an opposite direction to each other, both pockets are kept on a linear line over predetermined segment across the delivery position where the pocket (3c) in the winding wheel (3) and the pocket (4c) in the applying wheel are opposite to each other in a linear line, pushers (3d) for pushing the box-like items in the pockets of the winding wheel into the pockets of the applying wheel are disposed in such a way as they may be moved out or down, a sheet supplying mechanism for supplying the packaging sheet (B) to the outer circumference of the winding wheel is provided and a holding mechanism for temporarily holding the packaging sheet around the opening of the pocket of the winding wheel is provided.

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FIG. 8

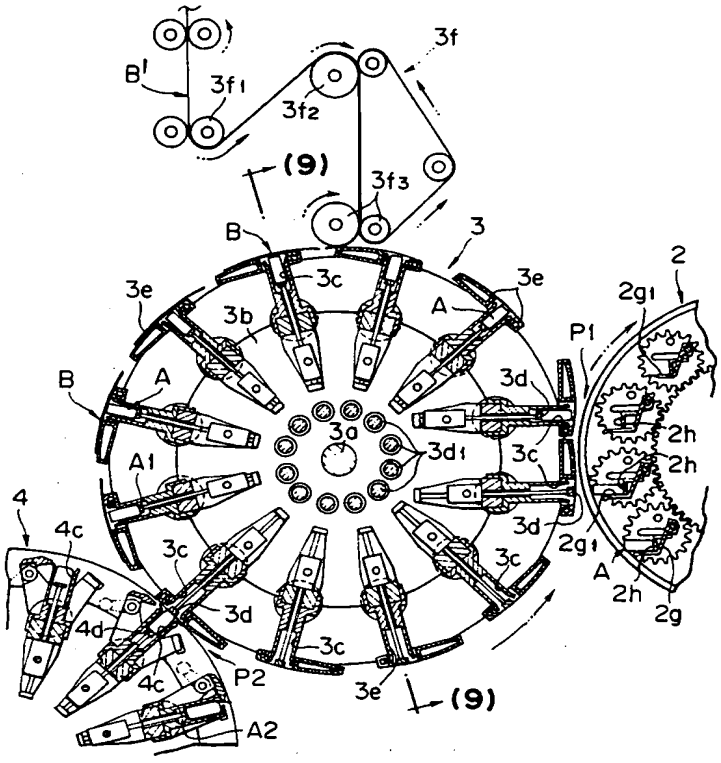

3f
B'
3f1
3f2
(9)
3f3
B
3
2
3e
3c
3e
2g1
3b
A
P1
B
A
3d
3a
3d1
2h
2h
3c
A1
4
4c
3c
3d
2g1
3c
A
2h
2g
4d
3d
3c
4c
P2
3e
(9)
A2

FIG. 12

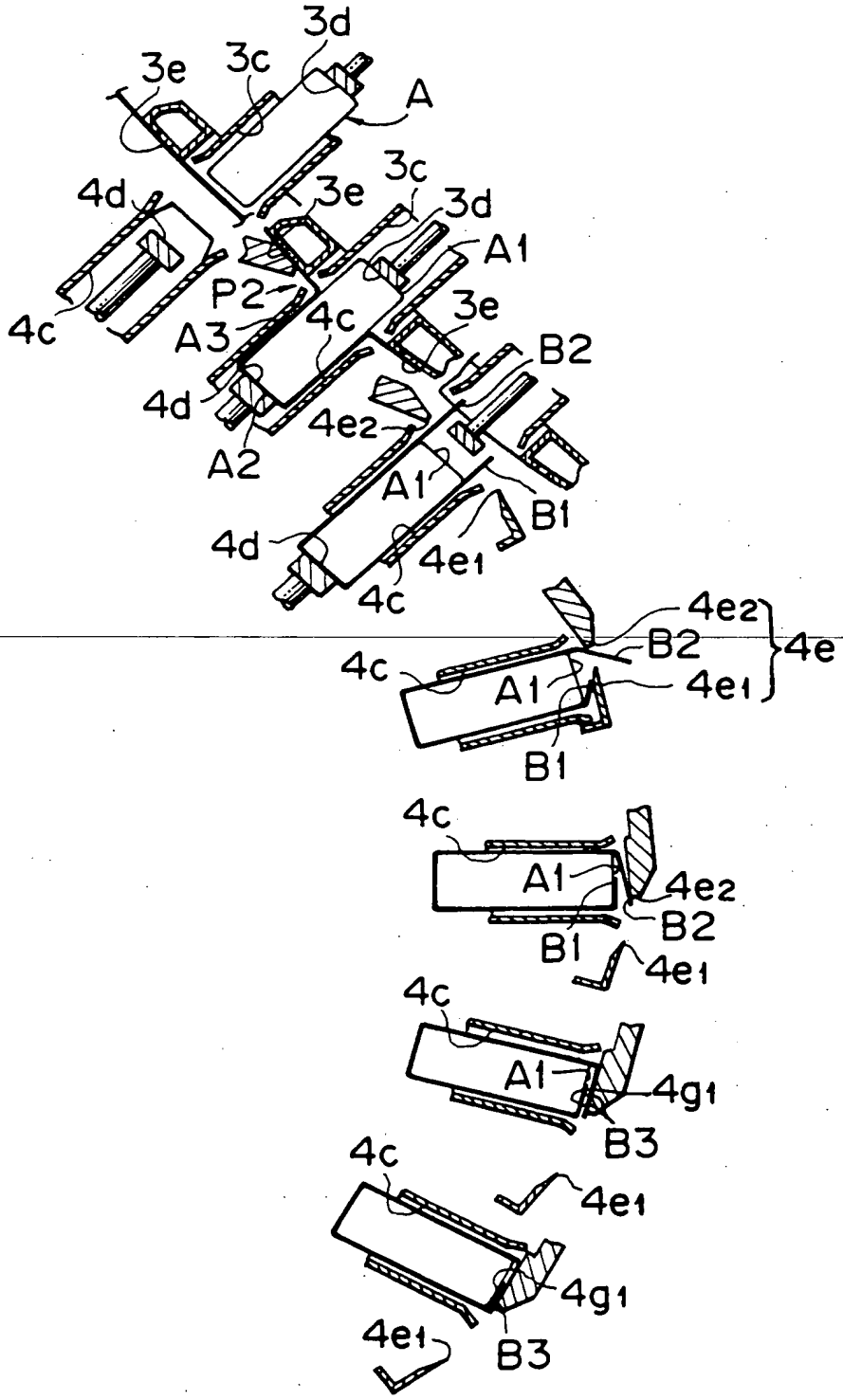

3d
3e
3c
A
4d
3e
3c
3d
A1
P2
4c
A3
4c
3e
B2
4d
4e2
A2
A1
B1
4d
4e1
4c
4e2
B2
4e
4c
A1
4e1
B1
4c
A1
4e2
B2
B1
4e1
4c
A1
4g1
B3
4c
4e1
4g1
4e1
B3

FIG. 13

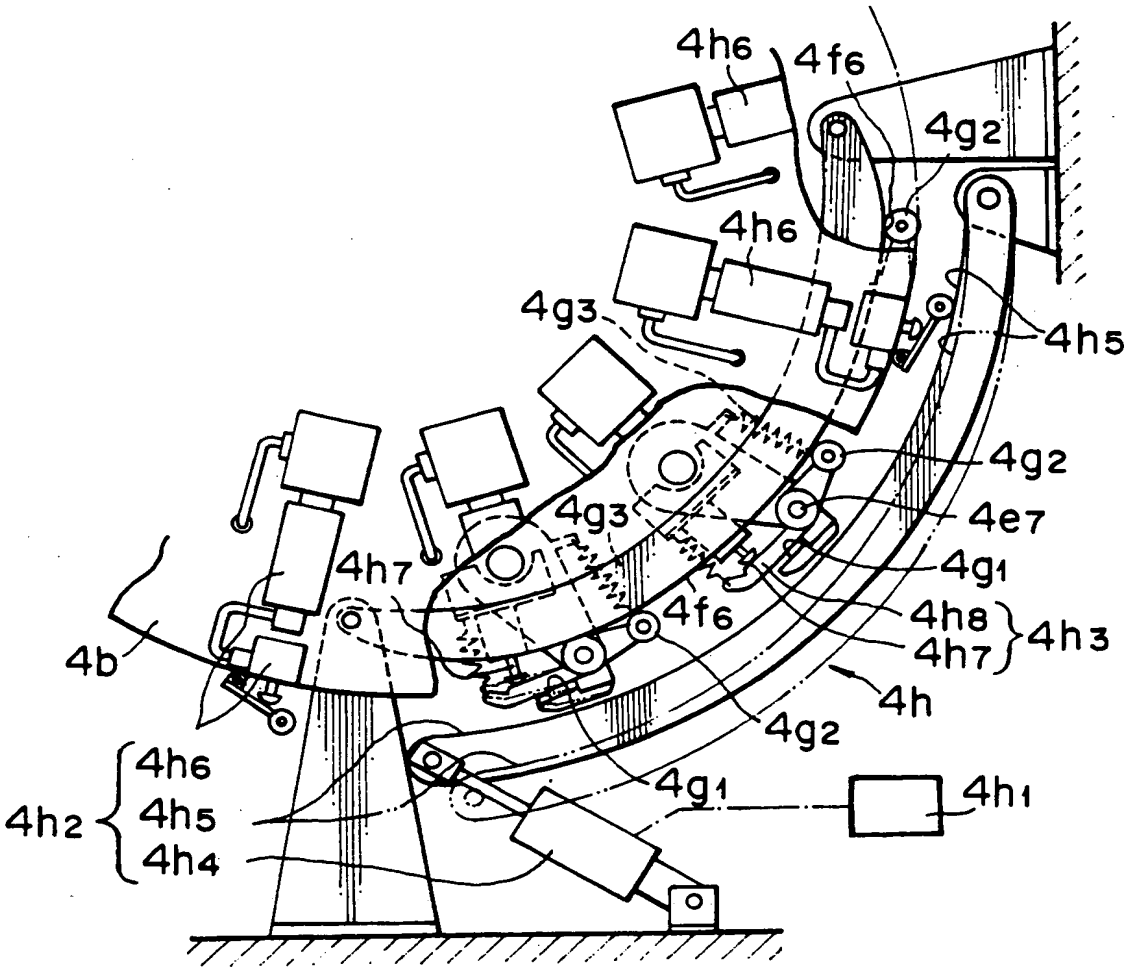

4h6
4f6
4g2
4h6
4g3
4h5
4g2
4g3
4e7
4h7
4g1
4f6
4h8
4h7
4h3
4b
4h
4g2
4h6
4h2
4h5
4h4
4g1
4h1

FIG. 10

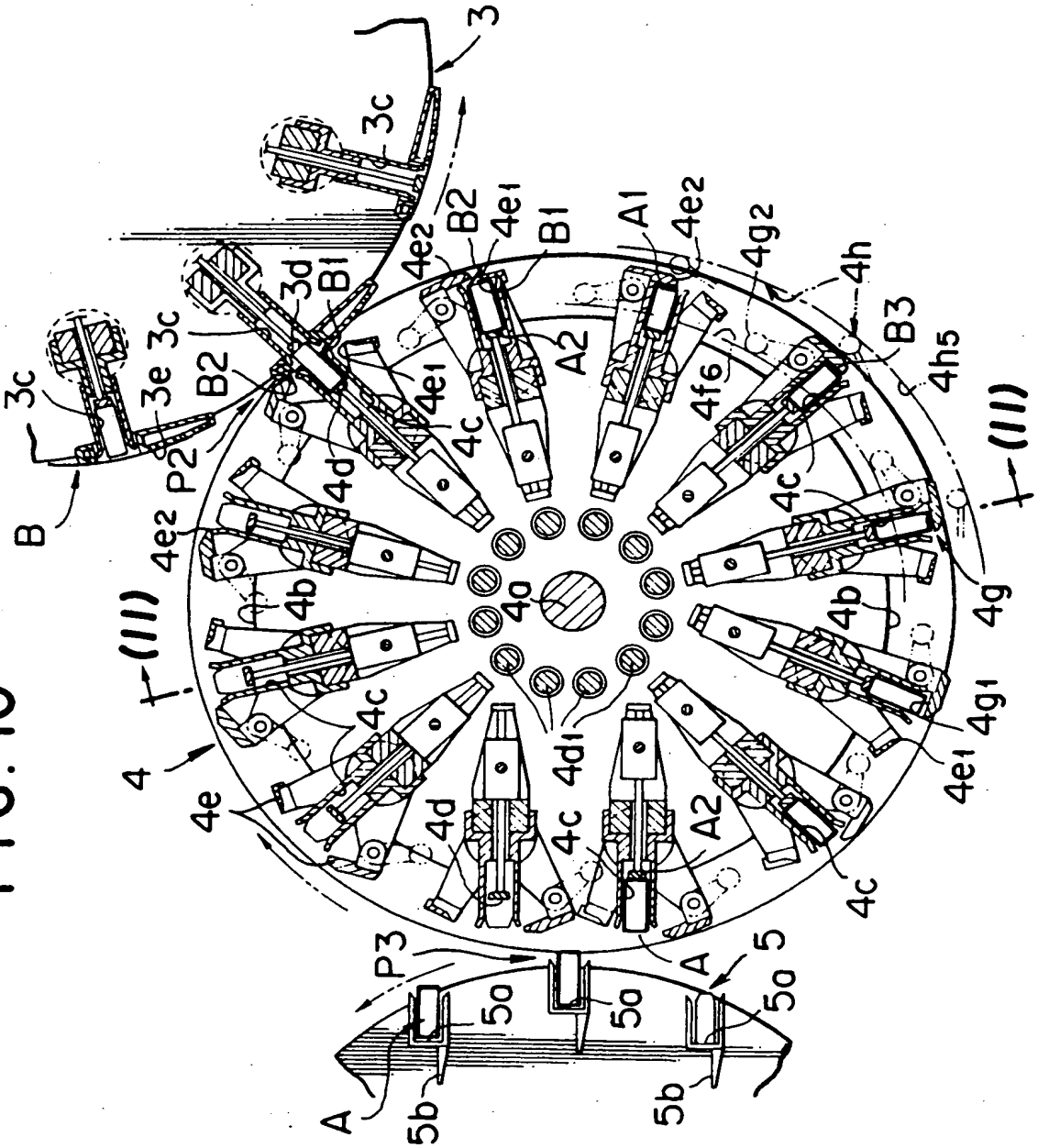

3
3c
3d
B1
B2
4e1
4e2
A1
A2
4g2
4h
B3
4h5
4f6
4c
4b
4a
4d
4d1
4e
4g
4g1
(III)
4
P2
P3
B
3e
5
5a
5b
A

FIG. 11

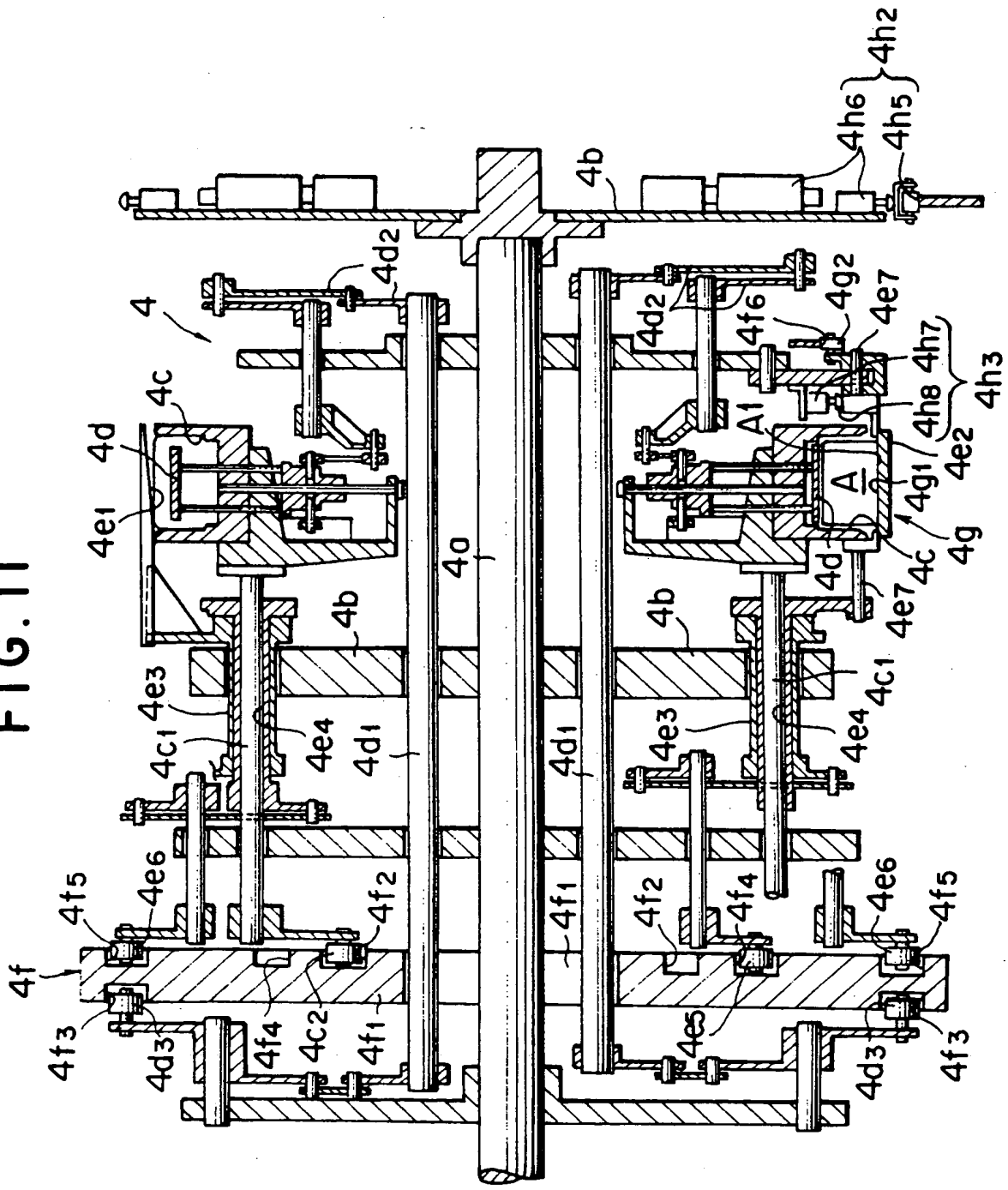

4h2
4h6
4h5
4b
4d2
4
4c
4d
4e1
4o
4h3
4h7
4h8
4e2
4g1
4g
4e7
4c1
4e3
4e4
4d1
4f1
4f2
4f4
4e6
4f5
4f
4f3
4d3
4c2
4e5
4g2
4f6
A1
A

FIG. 8

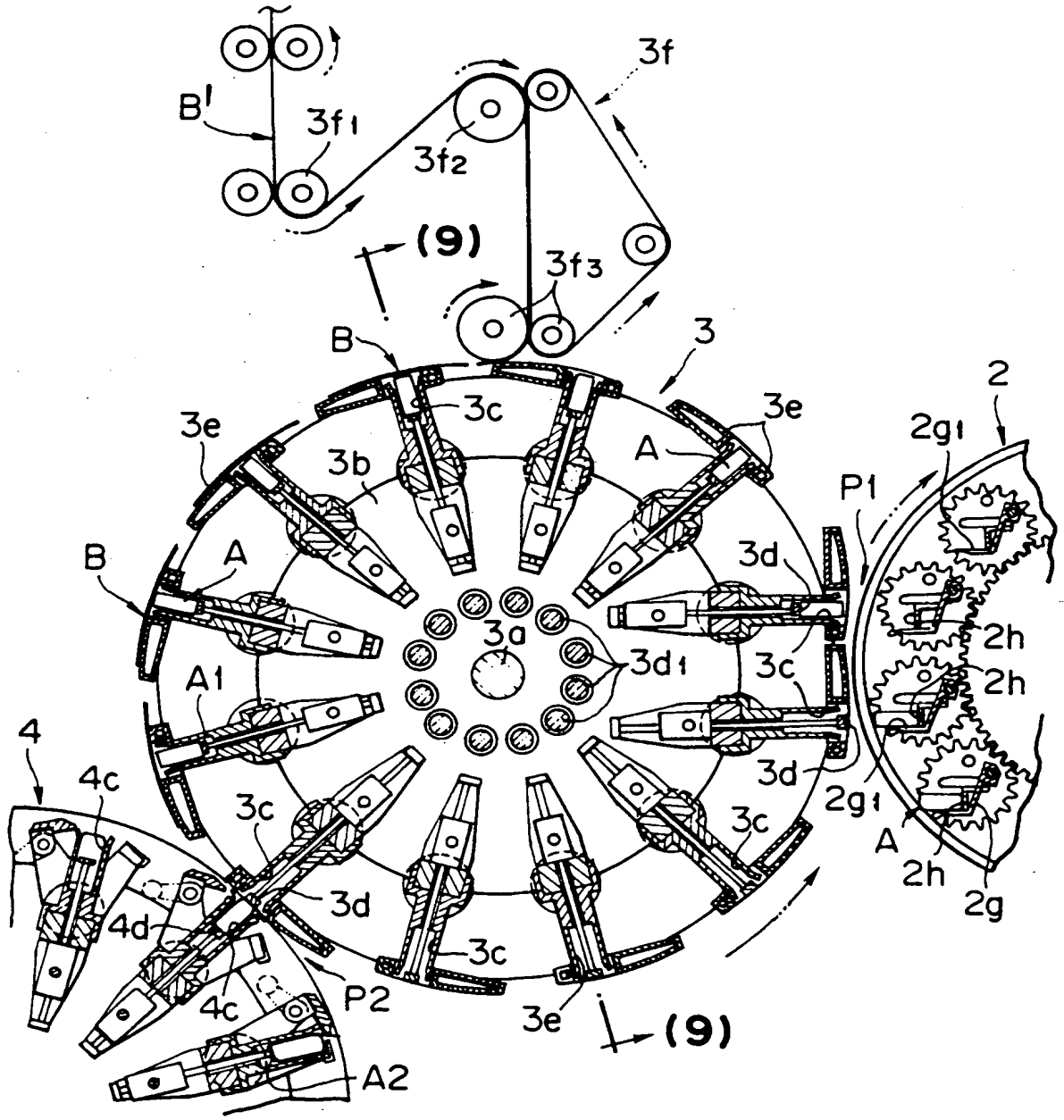
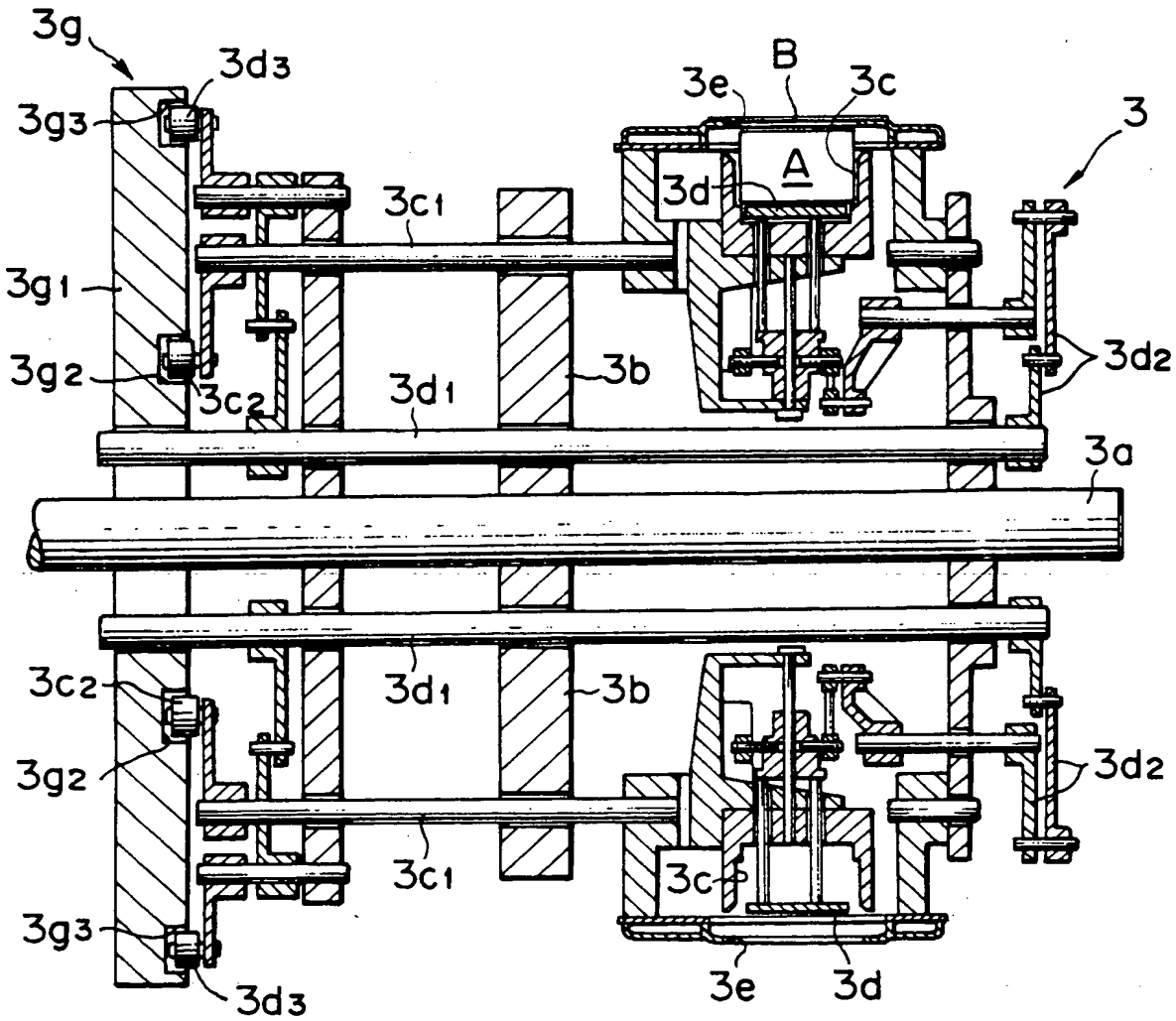


FIG. 9


3g
3d3
3g3
3e
B
3c
3
A
3d
3c1
3g1
3g2
3c2
3d1
3b
3d2
3a
3c2
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3b
3g2
3d2
3c1
3c
3g3
3d3
3e
3d

FIG. 6

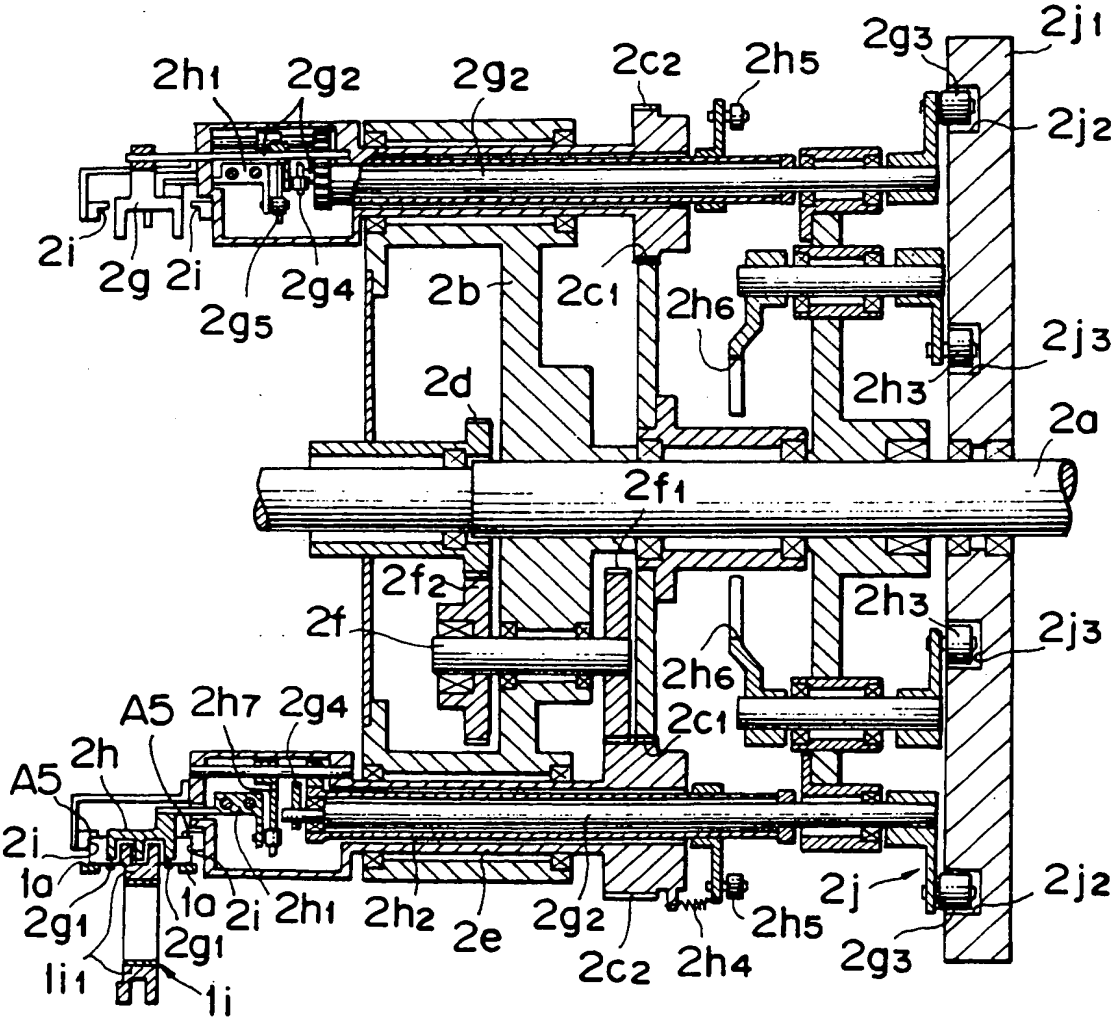
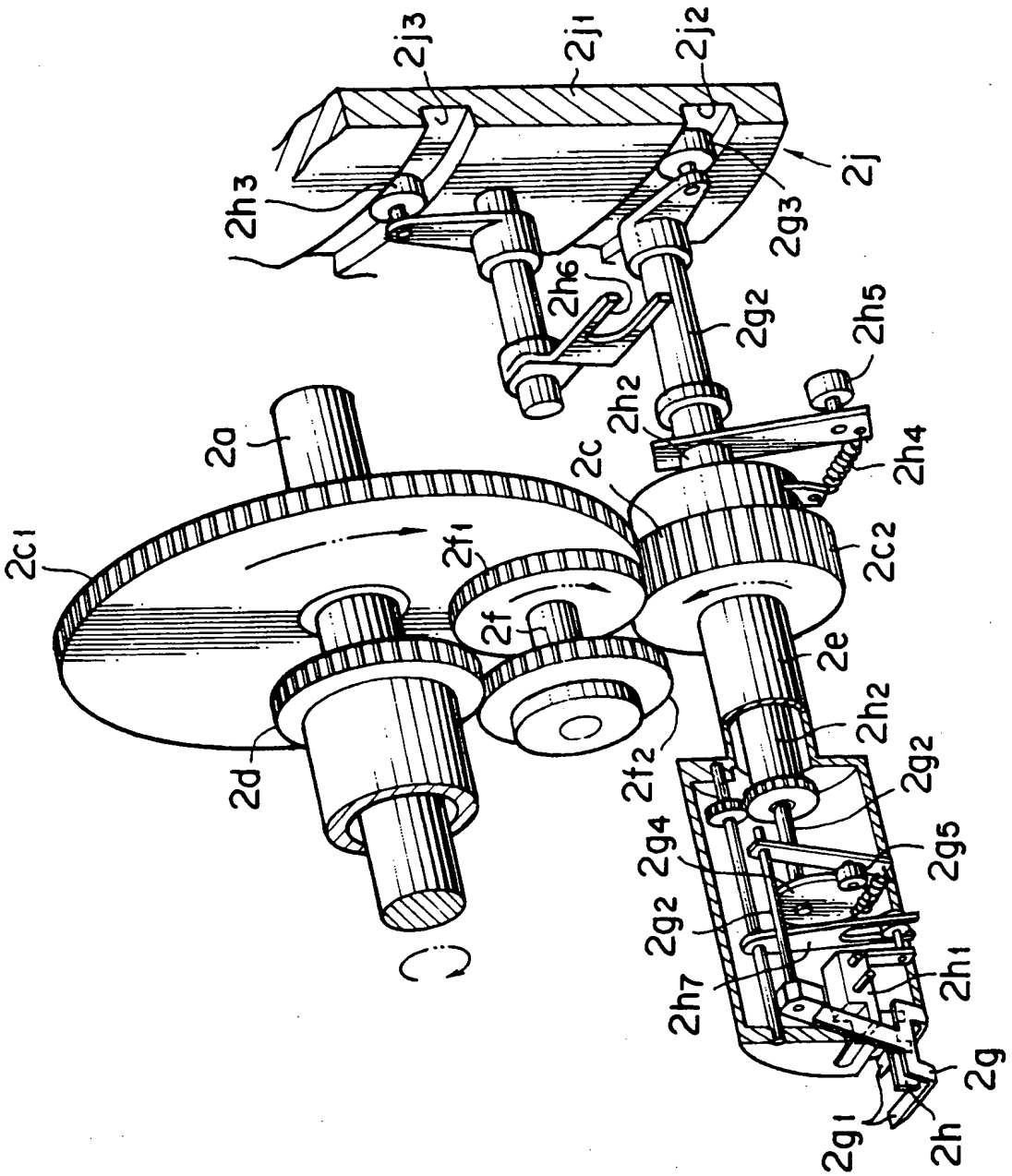


FIG. 7


2j3
2j1
2j2
2j
2h3
2g3
2h6
2g2
2h5
2h2
2a
2c
2h4
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2f1
2c2
2f
2e
2d
2f2
2h2
2g2
2g4
2g5
2g2
2h7
2h1
2g
2g1
2h

FIG. 4

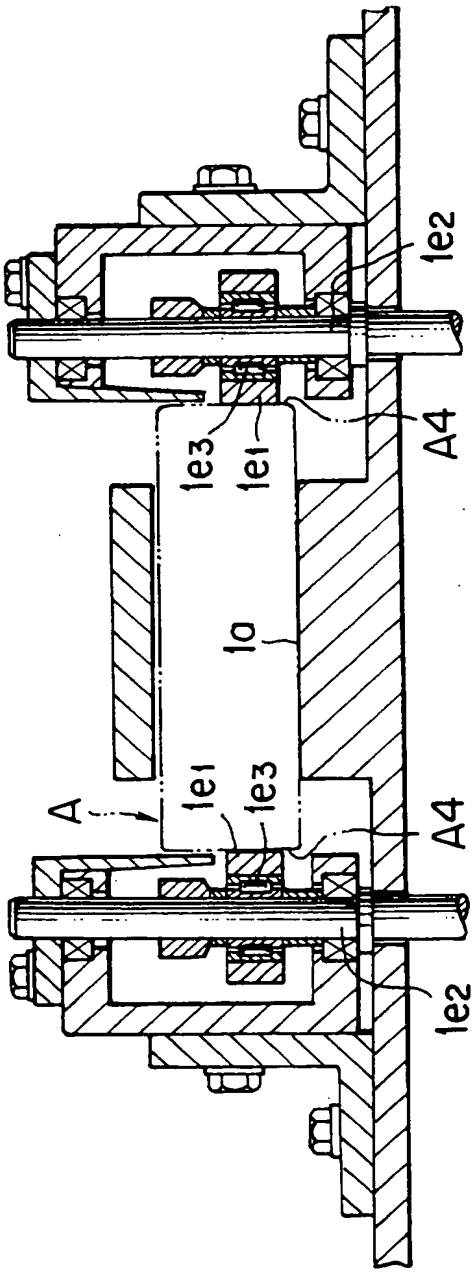


FIG. 5

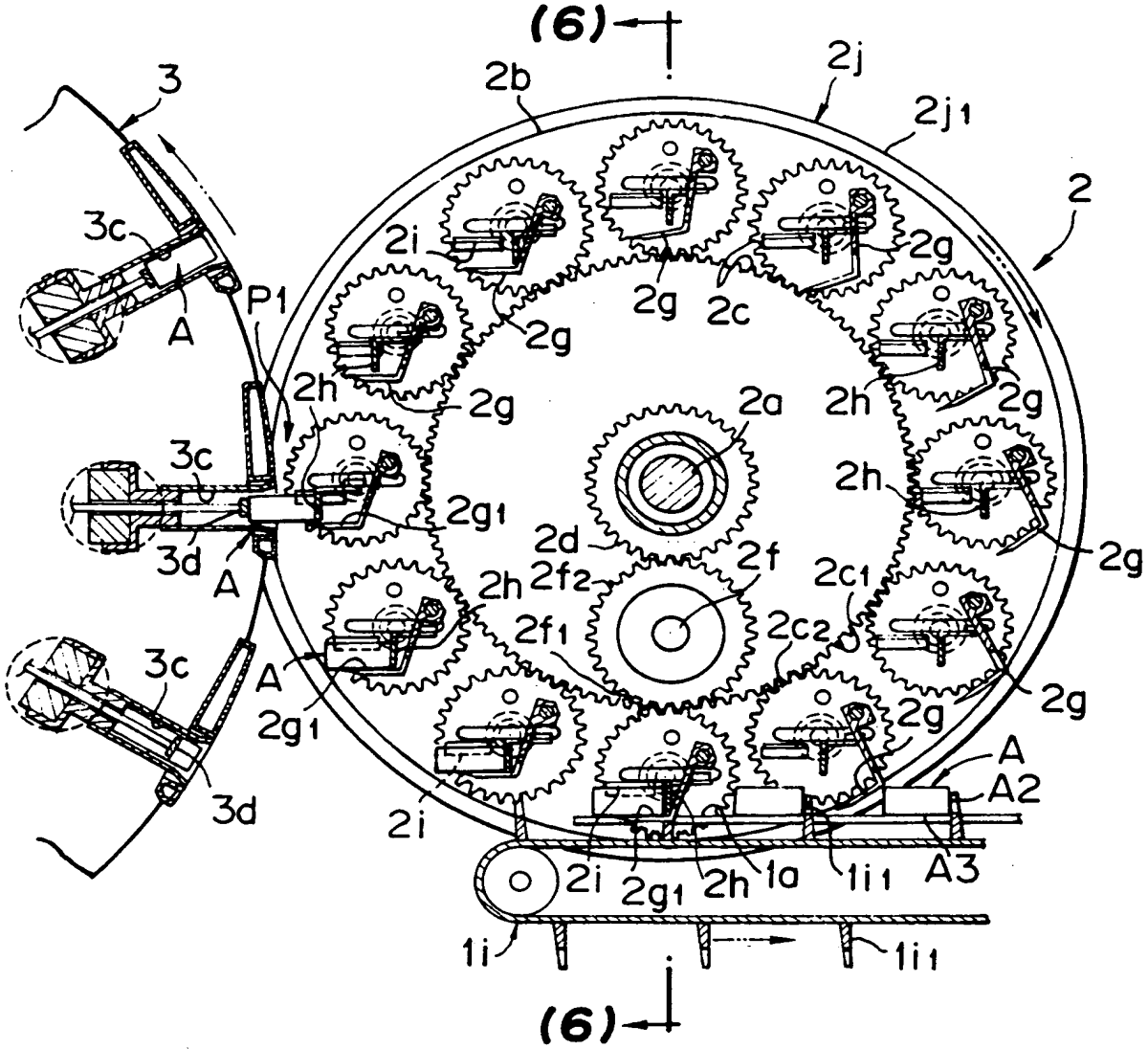

(6)
3
2b
2j
2j1
2
3c
2i
2g
2c
P1
A
2h
2g
2a
2h
2g
3c
2h
2g1
2d
2f
2g
3d
A
2h
2f2
2c1
2f1
2c2
3c
A
2g
2g
2g1
A
A2
3d
2i
2i
2g1
2h
1a
1i1
A3
1i
1i1
(6)

FIG. 2

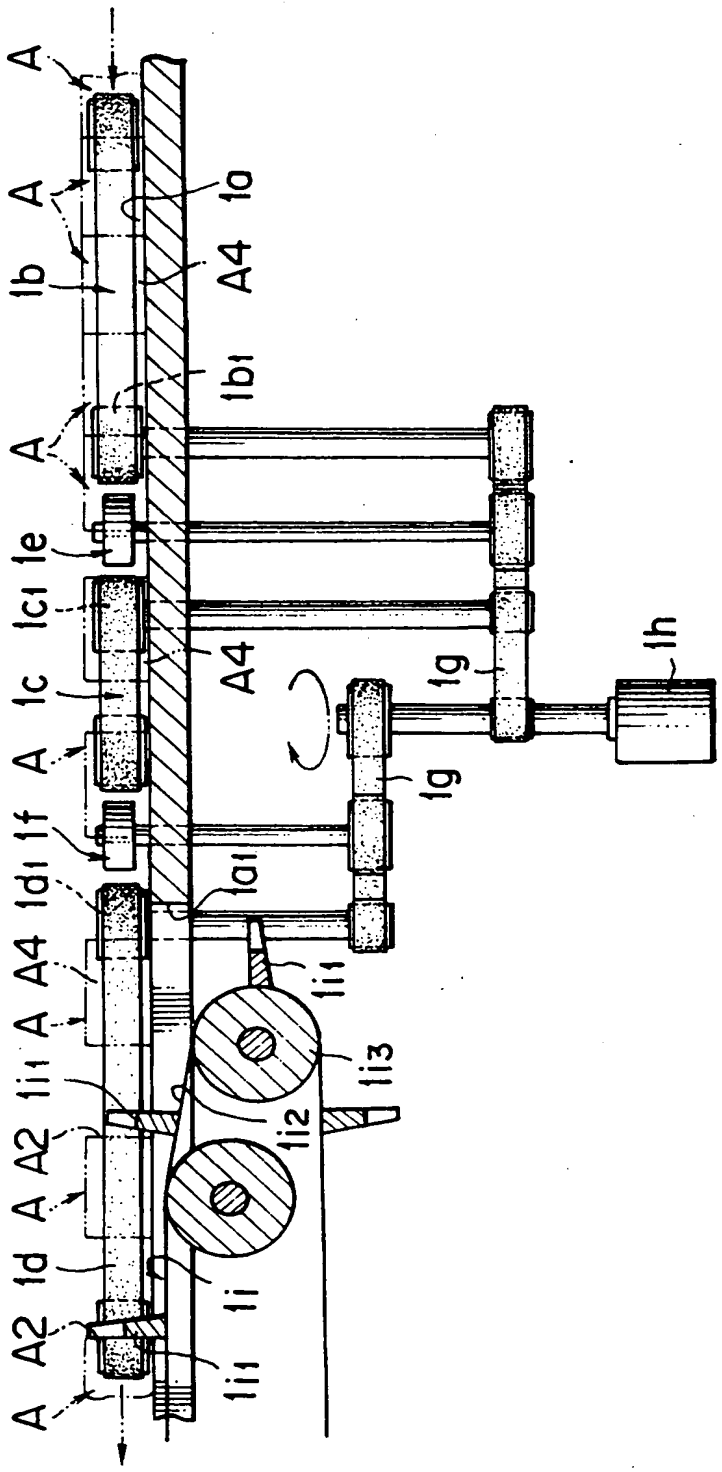
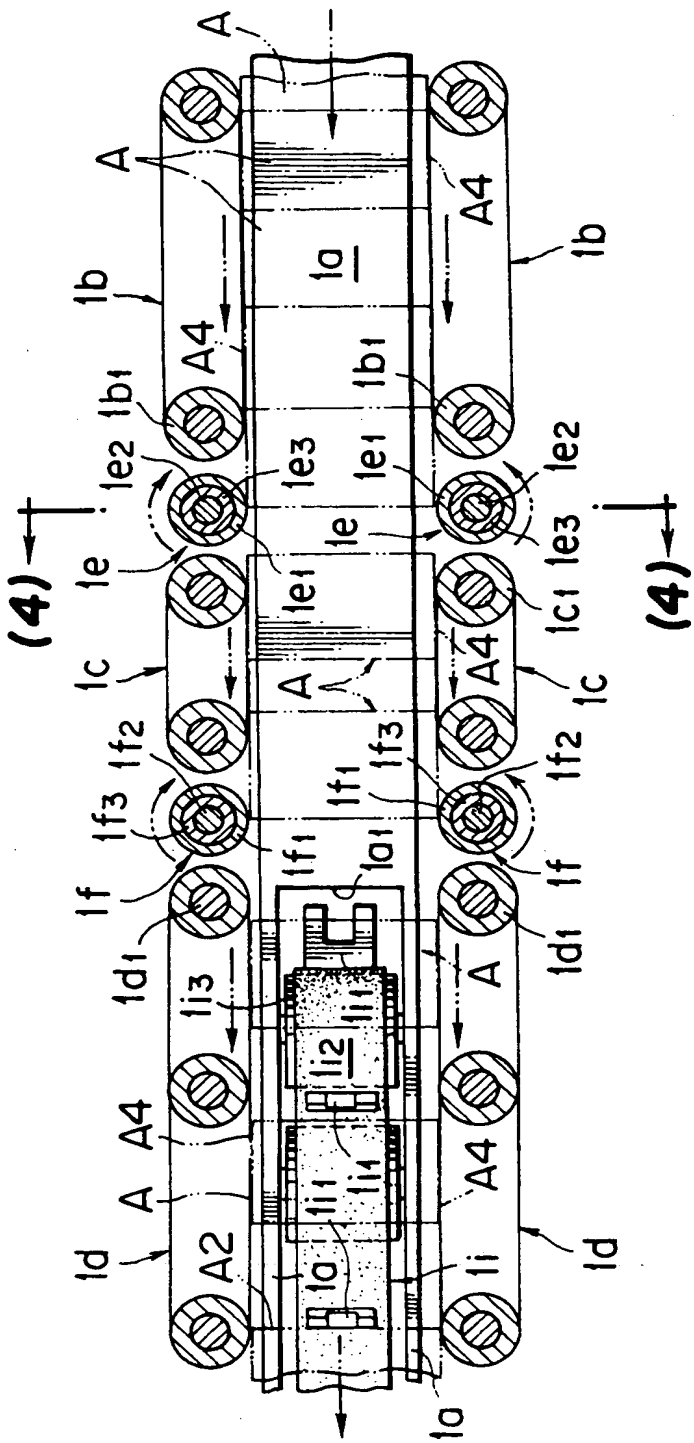

A
A
1b
A
1e
1c1
1c
A
1f
1d1
A4
A
1i1
A2
A
1d
A2
A
1o
A4
1b1
A4
1g
1g
1h
1a1
1i1
1i3
1i2
1i
1i1

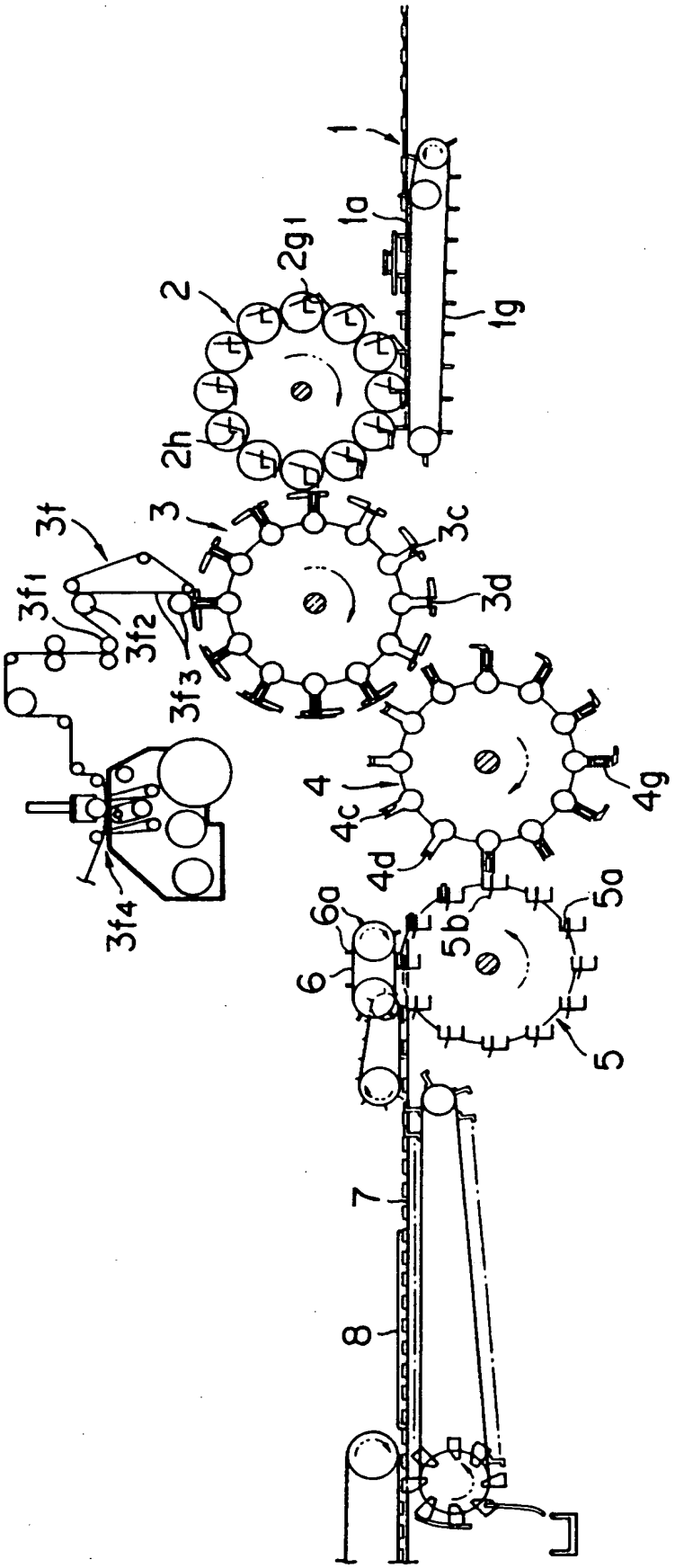
FIG. 3


A
A4
1a
1b
1b1
1c
1c1
1d
1d1
1e
1e1
1e2
1e3
1f
1f1
1f2
1f3
1a1
1i
1i1
1i2
1i3
1i4
A2
(4)

at an upstream side of it and opening the box-like items supplied while being in contact to each other and feeding them in equal-spaced apart relation.

9. A packaging device a t forth in Claim 8 in which the transferring roller abutting against the box-like item being transported is rotatably supported between an upstream side and a downstream side of the separating and supplying part, one-way clutch for transmitting rotation of a driving shaft toward an item transporting direction to an outer circumference is disposed between the outer circumference of the transferring roller and said driving shaft passing through a center of the roller and the outer circumference is rotated t a driving speed at the upstream side as the driving is transmitted from the driving shaft toward the outer circumference.

FIG. 1



BACKGROUND OF THE INVENTION

This invention relates to packaging device for covering a thermoplastic packaging sheet such as cellophane or polypropylene or the like on a box-like item such as a cigarette, and more particularly a device in which the.thermoplastic packaging sheet is supplied around some pockets of a winding wheel while the box-like items transported into the pockets are being continuously transferred, the box-like items are transported out of the pockets and delivered, thereby the packaging sheet is wound in a U-shape along a surface of the box-like item and both free ends of the packaging sheet are folded along the surface of the box-like item while the delivered box-like item is being continuously transferred, overlapped to each other and thermally adhered to each other.

A the prior art of this kind of packaging device, there is provided as disclosed in Japanese Patent Laid-Open No. Hei 2-85109, a packaging device in which a plurality of pockets are equally spaced apart at an outer circumference of a winding wheel continuously rotated, a concave curved chain conveyor is wound in an annular form adjacent to a predetermined segment at an outer circumference of the winding wheel, a plurality of pockets are disposed at the chain belt at the same spacing as that of installing of each of the pockets of the winding wheel, a heater belt is wound in an annular form adjacent to a predetermined segment outside the chain conveyor, these chain conveyor and heater belt are moved in synchronous with a rotational speed of the winding wheel at the same speed, the box-like items in the pockets are transferred in an arcuate form under a continuous rotation of the winding wheel the packaging sheet is held to cover the openings of the pockets during this arcuate transferring operation, thereafter the pocket of the winding wheel is oppositely faced against the pocket in the chain conveyor in linear manner, the box-like item is transported out of the pocket of the winding wheel and delivered to the pocket of the chain conveyor, thereby the packaging sheet is wound along the surface of the box-like item in a U-shape and then both free ends of the packaging sheet projected from the pocket are folded along an outer surface of the box-like item while being transported with the chain conveyor, overlapped to each other and the overlapped portions are abutted against the heater belt and thermally adhered to each other.

However, the prior art packaging device as described above has some problems that the annular chain conveyor is bent in a concave form over a predetermined spacing around an outer circumference of the winding wheel in order to perform a positive delivery of the box-like item from the pocket of the winding wheel into he pocket of the chain conveyor, so that a size of the chain conveyor positioned at a downstream side from a diameter part of the winding wheel is increased to cause an entire device to be large in size, its moving speed can not be increased due to a structure of the chain conveyor and thus the winding wheel can not be rotated at a high speed, resulting in that its processing speed shows a certain limit and its high speed can not be attained and so a large amount of packagings may not be carried out within a short period of time.

In addition, the prior art packaging device has some problems that due to a proportional relation between a moving speed of the chain conveyor and a contact time of the overlapped portions with the heater belt, when a rotational speed of the winding wheel or a moving speed of the chain conveyor is delayed more than their normal speeds during an energization of the device or a low speed operation of it, for example, a contact time between the overlapped portions and a sealing heater is extended more than the normal contact time to produce a seizure and as the rotational speed of the winding wheel or a moving speed of the chain conveyor is made fast, its speed difference is increased and the contact time between the overlapped portions and the heater belt may not be adopted.

In view of the aforesaid circumstances in the prior art, it is an object of the present invention to dispose a compact barrel winding means which can be transported at a high speed at a downstream side from the winding wheel and it another object of the present invention to keep a contact time between the overlapped portions and the sealing heater constant regardless of a variation of the rotational speed of the winding wheel.

SUMMARY OF THE INVENTION

A technical means applied by the present invention in order to solve the aforesaid problems is characterized in that an applying wheel continuously rotating in synchronous with a direction opposite to the rotational direction of the winding wheel is arranged in parallel near the downstream side of the winding wheel, each of the outer circumference of the winding wheel and the outer circumference of the applying wheel is provided with a plurality of pockets for every equal spacing toward a rotating direction in an oscillatable manner to which the box-like items are transported, these winding wheel and applying wheel are continuously rotated to each other in n opposite direction in synchronous with each other, both pockets are kept on a linear line over a forward and rearward predetermined segment at a position for delivery

where the pockets in the winding wheel and the pockets in the applying wheel are opposite to each other on the linear line, pushing device for forcibly transferring the box-like items within the pockets in the winding wheel into the pockets in the applying wheel in such a way as it may be moved out or moved in, a sheet supplying mechanism for supplying packaging sheet to an outer circumference of the winding wheel is provided and further a holding mechanism for temporarily holding the packaging sheet around openings of the pockets of the winding wheel is provided.

Each of the outer circumference of the winding wheel and the outer circumference of the applying wheel disposed in parallel with and near the winding wheel is provided with a plurality of pockets at equal spaced-apart spacings into which the box-like items are fed in, these winding wheel and applying wheel are rotated synchronously and continuously in an opposite direction to each other, and each of the pockets of the applying wheel is provided with a folding mechanism for folding both free ends of the packaging sheet projected out of the pocket outwardly along an outer surface of the box-like item and overlapping them from each other, and a sealing heater contact with the overlapped portions of the folded packaging sheet for thermal adhesion, respectively, and further there is provided a separating mechanism for separating the sealing heater from the overlapped portions after a specified period of time from a starting time of contact between the sealing heater and the overlapped portions of the packaging sheet.

According to the aforesaid technical means, the present invention is operated such that the box-like items fed into each of the pockets are transferred in an arcuate form under a continuous rotation of the winding wheel, the packaging sheet supplied from the sheet supplying mechanism during this arcuate transporting operation is held to cover the openings of the pockets with the holding mechanism, thereafter each of the pockets in the winding wheel and the pockets of the applying wheel opposite to the former is oscillated over a predetermined segment after the pocket reaches a portion near the delivery position, thereby these both pockets are kept on the linear line and at the same time the pushing device is projected and the box-like item is delivered into the pocket of the applying wheel.

As the applying wheel is continuously rotated, each of the pockets into which the box-like item is transported is moved in an arcuate manner and when the pocket reaches the predetermined angular position, the folding mechanism and the sealing heater are operated, thereby both free ends of the packaging sheet projected out of the pocket outwardly are folded along an outer surface of the box-like item and overlapped to each other and at the same time the sealing heater is in contact with them and the sealing heater is in contact with the overlapped portions under an operation of the separating mechanism only for a specified period of time.

BRIEF DESCRIPTION OF THE INVENTION

Fig. 1 is a front elevational view in longitudinal section for showing one preferred embodiment of the present invention;

Fig. 2 is a partial enlarged front elevational view in longitudinal section for showing a transporting conveyor;

Fig. 3 is a top plan view in cross section o Fig. 2;

Fig. 4 is a partial enlarged side elevational view in longitudinal section taken along a line (4)-(4) of Fig.3;

Fig. 5 is a partial enlarged front elevational view of transferring wheel;

Fig.6 is a front elevational view in longitudinal section taken along line (6)-(6) of Fig. 5;

Fig. 7 is a partial enlarged perspective view for showing a simplified structure of a transferring wheel with a part thereof being broken away;

Fig. 8 is a partial enlarged front elevational view in longitudinal section for showing a winding wheel;

Fig. 9 is an enlarged front elevational view in longitudinal section taken along a line (9)-(9) of Fig.8;

Fig. 10 is a partial enlarged front elevational view in longitudinal section for showing n applying wheel;

Fig. 11 is an enlarged side elevational view in longitudinal section taken along a line (11)-(11) of Fig. 10;

Fig. 12 is a partial enlarged front elevational view in longitudinal section for showing an operating state of a folding mechanism in accordance with an order of processes;

Fig.13 is a front elevational view for showing an operating state of a separating mechanism while being partially enlarged and partially broken away;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figs. 1, 2 and 5, the preferred embodiment of the present invention is constructed such that cigarettes packaged as box-like items A are continuously supplied to an upstream end of a horizontal transporting conveyor 1 while being in contact to each other. The box-like items A are spaced apart by a predetermined distance during

transportation by a transporting conveyor 1. These box-like items A are picked up one by one by a transferring wheel 2, transferred upwardly while being held in a horizontal state in an arcuate form and at the same time the box-like items A transferred in an arcuate manner are fed from the transferring wheel 2 into pockets 3c of a winding wheel 3, delivered from the pockets 3c of the winding wheel 3 into pockets 4c of an applying wheel 4, thereby a thermoplastic transparent film such as cellophane or polypropylene or the like acting as a packaging sheet B is wound along a surface of each of the box-like items A in a U-shaped form.

The transporting conveyor 1 is provided with a horizontal transferring passage 1 on which box-like items A are movably mounted. Three sets of horizontal belt conveyors 1b, 1b, 1c, 1d 1d are laterally disposed in a linear form in opposition to the right and left side surfaces A4, A4 of the box-like item A, respectively, as a separating and supplying part at an upstream side of the transferring passage 1a. A driving speed of the belt conveyors 1c, 1c disposed in the midway part is set faster than the driving speed of the belt conveyors 1b, 1b disposed at an upstream side. A driving speed of the belt conveyors 1d, 1d disposed at a downstream side is set faster than a driving speed of the intermediate belt conveyors 1c, 1c, and then each of a pair of feeding rollers 1e, 1e, 1f and 1f are disposed between these three sets of belt conveyors 1b 1b, 1c, 1c, 1d and 1d in opposition to the right and left side surfaces A4, A4 of the box-like item A.

Each of the feeding rollers 1e, 1f is disposed at a position where outer circumferences $1e_1$ and $1f_1$ are abutted against both side surfaces A4, A4 of the item A being transported, driving shafts $1e_2$, $1f_2$ inserted into central portions of the outer circumferences $1e_1$, $1f_1$ are connected to a driving source, each of them is rotated always in a transporting direction of the box-like item A, and at the same time one-way clutches $1e_3$, $1f_3$ are disposed between these outer circumferences $1e_1$, $1f_1$ and the driving shafts $1e_2$, $1f_2$.

One-way clutches $1e_3$, $1f_3$ have cam or roller between inner and outer circumferences so as to transmit a torque only or one rotation of inner or outer circumferences to perform idling rotation in respect to the other rotation, to transmit a rotation of the driving shafts $1e_2$, $1f_2$ toward a transporting direction to the outer circumferences $1e_1$, $1f_1$ and further a rotation of the driving shafts $1e_2$, $1f_2$ toward a transporting direction is transmitted to the outer circumferences $1e_1$, $1f_1$ and a rotation of the outer circumferences $1e_1$, $1f_1$ toward the transporting direction is rotated idly in respect to the driving shafts $1e_2$, $1f_2$.

Then, the driving pulleys $1b_1$, $1b_1$, $1c_1$, $1c_1$, $1d_1$, $1d_1$ of the belt conveyors 1b, 1b, 1c, 1c, 1d, 1d, and the driving shafts $1e_2$ $1e_2$, $1f_2$, $1f_2$ of the feeding rollers 1e, 1e, 1f, and 1f are cooperatively related to a driving source 1h such as a motor, for example, with a transmitting member 1g such as a belt being wound alternatively wherein a rotation of the driving shafts $1e_2$, $1e_2$, $1f_2$, $1f_2$ of the one way clutches $1e_3$, $1e_3$, $1f_3$, $1f_3$ toward a transmitting direction is drivingly transmitted to each of the outer circumferences $1e_1$, $1e_1$, $1f_1$, $1f_1$, resulting in that a rotational speed of the outer circumferences $1e_1$, $1e_1$ $1f_1$, $1f_1$ is made the same as that of the belt conveyors 1b, 1b, 1c, 1c respectively.

A belt conveyor 1i having pusher places $1i_1$ abutting against the rear surface A2 of the box-like item A equally spaced apart in a transporting direction is laterally disposed along a through-pass hole $1a_1$ opened in the transferring passage 1a at a further downstream side of the belt conveyors 1d, 1d set at the downstream side, wherein an upper surface of the belt $1i_2$ corresponding to the inlet is inclined downwardly as it is directed to an upstream side and as a pulley $1i_3$ positioned at the upstream end is rotated. The belt $1i_2$ is moved long it toward a transporting direction and it is projected out of the transferring passage 1a after each of the pusher plates $1i_1$ is raised in a substantially vertical orientation.

The transferring wheel 2 is rotatably disposed in a vertical direction near an upper part of the downstream side of the transporting conveyor 1, a driving shaft 2a is disposed horizontally in a rightward or leftward direction perpendicular to a horizontal transporting direction with the transporting conveyor 1 at its central part, the driving shaft 2a is cooperatively connected to the driving source of the transporting conveyor 1, thereby the transferring wheel 2 is continuously rotated in clockwise direction as viewed from a front side in synchronous manner as its circumferential speed becomes substantially the same as the moving speed of the pushing conveyor 1i.

This driving shaft 2a is immovably inserted into a central part of a disk 2b so as to cause the disk 2b to be cooperatively driven with a rotation of the driving shaft 2a and at the same time it i rotatably inserted into each of a sun gear $2c_1$ of a planetary gear mechanism 2c and a fixed gear 2d, and the fixed gear 2d is fixedly disposed without having any relation with a rotation of the driving shaft 2a.

At the disk 2b, each of twelve hollow shafts 2e is rotatably supported in equal-spaced apart relation in parallel with the driving shaft 2a. Planetary gears $2c_2$ engaging with the sun gear $2c_1$ of the planetary gear mechanism 2c are cooperatively disposed at outer circumference of base ends of these hollow shafts 2e. A cooperating shaft 2f is

rotatably supported in parallel between the hollow shafts 2e and the driving shaft 2a, and then a cooperating gear $2f_1$ engaging with one of the planetary gears $2c_2$ and driving gear $2f_2$ engaging with the fixed gear 2d are cooperatively disposed at an outer circumference of the cooperating shaft 2.

Accordingly, the driving shaft 2a causes the transferring wheel 2 to be rotated in a clockwise direction as viewed from a front side thereof, thereby the disk 2b is rotated in a clockwise direction, the hollow shafts 2e are rotated in the clockwise direction and at the same time a driving gear $2f_2$ is freely rotated around the fixed gear 2d. The cooperating shaft 2f and the cooperating gear $2f_1$ are rotated in a clockwise direction, thereby the planetary gears $2c_2$ of the planetary gear mechanism 2c are freely rotated in a counterclockwise direction as viewed from a front side and then relative positions of the twelve hollow shafts 2e are kept at a predetermined angle without having any relation with the rotational position of the transferring wheel 2.

At the extreme ends of the hollow shafts 2e are disposed holding claws 2g opposing against the rear surface A2 and the bottom surface A3 of the box-like item A horizontally fed by the pusher conveyor 1i while being moved to or away from the transporting rail for the transporting conveyor 1, pushers 2h near these holding claws 2g and opposing against the rear surface A2 of the box-like item A, and holding guides 2i opposing to a mounting surface $2g_1$ formed at lower parts of the holding claws 2g.

The holding claws 2g are formed in a substantial L-shape as viewed from a front side in which the mounting surfaces $2g_1$ are divided into two segments in a positional relation not contact with the downstream ends of the transferring passages 1a, 1a separated in a rightward or leftward direction of the transporting conveyor 1 in a transporting direction, the mounting surfaces $2g_1$, $2g_1$ at the lower parts are oscillatably supported in a transporting direction and a counter-transporting direction and at the same time the rotating shafts $2g_2$ cooperatively disposed at the upper end thereof are rotatably supported within the hollow shafts 2e and then the rotating shafts $2g_2$ are cooperatively related to control cam 2j to be described later.

The pushers 2h are disposed in such a positional relation as one in which they may not be abutted against the pusher plates 1i of the pusher conveyor 1i and the mounting surfaces $2g_1$, $2g_1$ of the holding claws 2g in a transporting direction, the rotating cylinders $2h_2$ reciprocatably supported in a transporting direction and counter transporting direction against the extremity ends of the hollow shafts 2e and cooperatively related to the supporting and moving part $2h_1$ are rotatably supported in the hollow shafts 2e and at the same time the rotating cylinders $2h_2$ are cooperatively related to the control cm 2j to be described later.

The holding guides 2i are fixed and disposed between the mounting surfaces $2g_1$, $2g_1$ of the holding claws 2g oscillated in a transporting direction in a horizontal state with respect to the extremity ends of the hollow shafts 2e while being spaced apart by a distance corresponding to a vertical height size of the box-like item A and they are formed to have a shape to be slidably fitted in a transporting direction to the right and left edge corners A5, A5 at the upper surface of the box-like item A placed on the mounting surfaces $2g_1$, $2g_1$.

Control cam 2j is constructed such that fixed cam plate $2j_1$ fixed and disposed in spaced-apart and in parallel with the transferring wheel 2 has a grooved cam $2j_2$ for controlling positions of the holding claws 2g to which the rotating shafts $2g_2$ of the holding claws 2g are engaged through a driven roller $2g_3$ and a grooved cam $2j_3$ for controlling a position of the pushers 2h to which the rotating cylinder 2h of the pushers 2h are engaged through a driven roller $2h_3$ while being formed annularly and concaved, midway parts of the rotating shafts $2g_2$ of the holding claws 2g are divided and n eccentric cam $2g_4$ and a cam roller $2g_5$ always abutted against the eccentric cam $2g_4$ are disposed.

In addition, the rotating cylinders 2_h of the pushers 2h are cooperatively related to the hollow shafts 2e through resilient members $2h_4$ such as springs, for example, projections $2h_5$ and concave portions $2h_6$ to be fitted to each other at a predetermined position are cooperatively disposed at each of the base ends of the rotating cylinders 2h and the driven rollers $2h_3$ and at the same time oscillating levers $2h_7$ are cooperatively disposed at the extremity ends of the rotating cylinders $2h_2$ and further cooperatively related to the supporting and moving parts $2h_1$ of the pushers 2h.

The control cam 2j is operated such that as the driving shaft 2a is rotated, the holding claws 2g and the pushers 2h are rotated in a clockwise direction and at the same time each of the driven rollers $2g_3$, $2h_3$ is moved along the grooved cam $2j_2$, $2j_3$ of the fixed cam plate $2j_1$, relative position of the driven rollers $2g_3$ is moved, thereby the rotating shafts $2g_2$ and the eccentric cams $2g_4$ are rotated, and as each of the holding claws 2g reaches a predetermined angular position with an angle corresponding to about 10 o'clock in clock of the transferring wheel 2 in the preferred embodiment and moved toward an angle corresponding to about 4 o'clock through the upper limit position of the transferring wheel 2. The mounting surfaces $2g_1$, $2g_1$ are oscillated around the rotating shaft $2g_2$ in a

counter transporting direction and inclined downwardly, thereafter it reaches an angle corresponding to about 5 o'clock and moves toward an angle corresponding to about 6 o'clock i.e. a lower limit position of the transferring wheel 2, the mounting surfaces $2g_1$, $2g_1$ are slid around the rotating shaft $2g_2$ toward the transporting direction to become a horizontal state and subsequently the mounting surfaces $2g_1$, $2g_1$ are kept in a horizontal sate until it reaches an angle corresponding to about 10 o'clock.

In addition, as relative positions of the driven rollers $2h_3$ are moved each of the projections $2h_5$ and the concave portions $2h_6$ is fitted to each other only for a predetermined segment. The hollow shafts 2e and the rotating cylinders $2h_2$ are normally cooperatively operated to keep these relative positions at a predetermined angle without having any rotational position of the transferring wheel 2, resulting in that although the supporting and moving parts $2h_1$ and the pushers 2h are not moved, when each of the pushers 2h reaches a predetermined angular position, an angle corresponding to about 8:30 o'clock in the transferring wheel 2 in the preferred embodiment. The projections $2h_5$ and the concave parts $2h_6$ are fitted to each other and as each of the pushers 2h passes through a delivery position P1 opposite in a linear line against the pockets 3c of the winding wheel 3 to be described later and reaches toward an angle corresponding to about 9:30 o'clock, it extends the resilient member $2h_4$ to cause the oscillating lever $2h_7$ to be oscillated in a transporting direction, thereby the supporting and moving parts $2h_1$ and the pushers 2h are projected.

After this operation, as it reaches toward an angle which corresponds to about 10:30 o'clock, it shortens the resilient members $2h_4$ to cause the oscillating lever $2h_7$ to be oscillated in counter-transporting direction, thereby the supporting and moving parts $2h_1$ and the pushers 2h are moved down, and subsequently the supporting and moving parts $2h_1$ and the pushers 2h are waited at their moving-down positions until the fitted condition between the projections $2h_6$ and the concave parts $2h_6$ is released and they reach an angle corresponding to about 8:30 o'clock.

The winding wheel 3 is disposed near a downstream side of the transferring wheel 2 and further rotatably arranged in a vertical direction, the driving shaft 3 acting as center of rotation is disposed in a rightward or leftward direction in a horizontal state, the driving shaft 3a is cooperatively related with the driving source of the transferring wheel 2, thereby the winding wheel 3 is continuously rotated synchronously in counterclockwise direction as viewed from a front side in such a way as its peripheral speed becomes substantially equal to a peripheral speed of the transferring wheel 2.

The driving shaft 3a is rotatably inserted into the center of the disk 3b to cause the disk 3b to be cooperatively driven with a rotation of the driving shaft 3a, each of the twelve driving shafts $3c_1$ is rotatably supported in equal spaced apart relation around the outer circumference of the disk 3b in parallel with the driving shaft 3 and at the same time each of the pockets 3c is fixed to the extremity ends of the driving shafts $3c_1$ in a radial orientation in which a center of the driving shaft 3a occupies a center, the pockets 3c are oscillatably supported under a rotation of these driving shafts 3c1, ahead each of twelve rotating shafts $3d_1$ of the pushers 3d to be described later is rotatably supported in parallel in equal-spaced apart relation in a circumferential direction.

These pockets 3c are formed into a box-shape having a substantial same size as an outer shape size of the box-like item A opened at its outer surface, the pushers 3d are disposed in the pockets in a radial direction of the winding wheel 3 in such a way as they may be projected out or moved down, a holding mechanism 3e composed of a suction surface, for example, is disposed at a circumference of the opening and then the packaging sheet B continuously supplied from the sheet supplying mechanism 3f to be described later is temporarily sucked and held so as to cover the opening of each of the pockets 3c.

The pushers 3d are disposed in opposition to the inner surfaces A1 of the box-like items A transported into the pockets 3c and cooperatively related to the rotating shafts $3d_1$ through links $3d_2$, and then the driving shafts $3c_1$ of the pockets 3c and the rotating shafts $3d_1$ of the pushers 3d are cooperatively related to the control cam 3g to be described later.

The control clam 3g is constructed such that the cam plate $3g_1$ spaced apart in parallel with the winding wheel 3, fixed and disposed thereto has a grooved cam $3g_2$ for controlling a position of each of the pockets 3c to which the driving shafts $3c_1$ of the pockets 3c are engaged through driven rollers $3c_2$ and a grooved cam $3g_3$ for controlling a position of each of the pushers 3d to which the rotating shafts $3d_1$ of the pushers 3d are engaged through the driven rollers $3d_3$ under an annular formation.

The control cam 3g is constructed such that as the driving shaft 3a is rotated, the pockets 3c and pushers 3d are rotated in a counterclockwise direction, each of the driven rollers $3c_2$, $3d_3$ are moved along the grooved cams $3g_2$, $3g_3$ of the cam plate $3g_1$, the relative positions of the driven rollers $3c_2$ are moved. thereby the rotating shafts $3c_1$ are rotated, each of the pockets 3c is oscillated until it reaches a predetermined spacing of a delivery position P1 opposing on a linear line against the

mounting surfaces $2g_1$, $2g_1$ of the transferring wheel 2, i.e. an angle corresponding to about 3:30 o'clock of the winding wheel 3 in the preferred embodiment and reaches an angle corresponding to about 2:30 o'clock and it is kept on a liner line with the mounting surfaces $2g_1$, $2g_1$ of the transferring wheel 2.

After that, each of the pockets 3c is oscillated until it reaches a predetermined spacing across a delivery position P2 where each of the pockets 3c opposes on linear line to the pocket 4c of the applying wheel 4 to be described later, an angle corresponding to about 8 o'clock of the winding wheel 3 and reaches an angle corresponding to about 7:30 o'clock in the preferred embodiment and then each of the pockets is kept on a linear line with the pocket 4c of the applying wheel 4.

In addition, the relative positions of the driven rollers $3d_3$ are moved to cause the rotating shafts $3d_1$ to be rotated, each of the pockets 3c reaches a predetermined spacing across the delivering position P2 opposing on the linear line of it to the pockets 4c of the applying wheel 4, an angle corresponding to about 8 o'clock of the winding wheel 3, in the preferred embodiment, and moves toward an angle corresponding to about 7 o'clock, the pushers 3d are cooperatively pushed in response to a moving-down of the pushers 4d of the applying wheel 4. Each of the pockets 3c reaches a predetermined spacing across the delivery position P1 opposing on a liner line to the mounting surfaces $2g_1$, $2g_1$ of the transferring wheel 2 as required, an angle corresponding to about 3:30 o'clock of the winding wheel 3, then it moves toward an angle corresponding to about 2:30 o'clock and the pushers 3d are cooperatively moved in response to the projecting movement of the pushers 2h of the transferring wheel 2 and they are moved down while being abutted against the inner surface A1 of the box-like item A to be transported in.

Outer circumference of the winding wheel 3 is provided with a sheet supplying mechanism 3f for continuously supplying the packaging sheet B, and the sheet supplying mechanism 3f has in the midway part of feeding out passage B' for the packaging sheet B formed toward the rotating passage from the sheet supplying source (not shown) toward the rotating passage of the pockets 3c of the winding wheel 3, a feeding-out part $3f_1$ for drawing the packaging sheet B at a slower speed than a peripheral speed in cooperation with the driving source of the winding wheel 3 a cutter $3f_2$ for cutting the packaging sheet B by a predetermined length toward feeding-out direction, a transferring part $3f_3$ for transferring the cut packaging sheet B toward the rotating passage of the pockets 3c at the same speed as its peripheral speed and a printer $3f_4$ for instantaneously printing information such as a manufacturing date as required

Then, the applying wheel 4 is disposed on a downstream side of the winding wheel 3 in a downward slant angle of 45° rotatably in a vertical direction, a driving shaft 4a acting as a rotational center is arranged in a horizontal direction in a rightward or a leftward direction, the driving shaft 4a is cooperatively related to the driving source of the applying wheel 3 and the applying wheel 4 is continuously rotated in a clockwise direction as viewed from a front side synchronously in such way as its peripheral speed becomes substantially the same as that of the applying wheel 3.

The driving shaft 4a is immovably inserted through a center of the disk 4b to cause the disk 4b to be cooperated with a rotation of the driving shaft 4a, each of twelve driving shafts $4c_1$ is equally spaced apart around the outer periphery of the disk 4b and rotatably supported in parallel with the driving shaft 4a and at the same time each of the pockets 4c is radially fixed to the extremity ends of the rotating shafts $4c_1$ with the center of the driving shaft 4a being applied as a center, the pockets 4c are oscillatably supported under a rotation of the driving shafts $4c_1$ and each of twelve rotating shafts 4d of the pushers 4d to be described later is equally spaced apart toward a peripheral direction and rotatably supported in parallel with the driving shaft 4a.

These pockets 4c are constructed into a box-like shape in which their outer surfaces have substantial same size as an outer size of the box-like item A opened, the pushers 4d are disposed therein in a radial direction of the applying wheel 4 in such a way as they may be projected out or moved down, and the peripheral part of the opening is provided with folding claws $4e_1$ and folding pieces $4e_2$ constituting the folding mechanism 4e in such a way as they may be moved to or away from the outer surface A1 of the box-like item A transported into each of the pockets 4c while being opposite thereto.

The pushers 4d are disposed in opposition to the inner surfaces A2 of the box-like items A transported into the pockets 4a, cooperated with the rotating shafts $4d_1$ through links $4d_2$ and each of the rotating shafts $4c_1$ of the pockets 4c and the rotating shafts $4d_1$ of the pushers 4d is cooperatively related to the control cam 4f to be described later.

Folding claws $4e_1$ and folding pieces $4e_2$ are disposed in opposition to each of both free ends B1, B2 of the packaging sheet B projected outwardly from the pockets 4c, the folding claws $4e_1$ are cooperatively related to the hollow shafts $4e_3$ rotatably disposed at outer circumferences of the rotating shafts $4c_1$ to which the pockets 4c are

fixed, the folding pieces $4e_2$ are cooperatively related with the rotating cylinders $4e_4$ rotatably arranged at the outer circumferences of the rotating shafts $4c_1$ and the hollow shafts $4e_3$ of the folding claws $4e_1$ add the rotating cylinders $4e_4$ of the folding pieces $4e_2$ are also cooperatively related with the control cam 4f to be described later.

The control cam 4f is constructed such that the cam plate $4f_1$ spaced apart in parallel with the applying wheel 4, fixed and disposed has a grooved cam $4f_2$ for controlling positions of the pockets 4c to which the rotating shafts $4c_1$ of the pockets 4c are engaged through the driven rollers $4c_2$. A grooved cam $4f_3$ for controlling positions of the pushers 4d to which the rotating shafts $4d_1$ of the pushers 4d are engaged through the driven rollers 4d a grooved cam $4f_4$ for controlling positions of the folding claws $4e_1$ to which the hollow shafts $4e_3$ of the folding claws $4e_1$ are engaged through the driven rollers $4e_5$ and a fixed cam $4f_6$. The grooved cam $4f_6$ for controlling positions of the folding pieces $4e_2$ to which the rotating cylinders $4e_4$ of the folding pieces $4e_2$ are engaged through the driven rollers $4e_6$ is formed in an annular form and shaped in a concave manner and at the same time the fixed cam $4f_6$ is vertically disposed in opposition to the driven rollers $4g_2$ of the sealing heaters 4g to be described later.

Then, the control cam 4f is operated such that as the driving shaft 4a is rotated the pockets 4c pushers 4d, folding claws $4e_1$ and folding pieces $4e_2$ are rotated in clockwise direction and at the same time the driven rollers $4c_2$, $4d_3$, $4e_5$, $4e_6$ are moved along the grooved cams $4f_2$ $4f_3$, $4f_4$, $4f_5$ of the cam plate $4f_1$, respectively, and the relative position of the driven rollers $4c_2$ is moved, thereby the rotating shafts $4c_1$ are rotated, each of the pockets 4c is oscillated from each of the pockets 4c reaches a predetermined spacing across the delivery position P2 opposite in a linear line against the pockets 3c of the winding wheel 3, i.e. an angle corresponding to about 1 o'clock of the applying wheel 4 in the preferred embodiment to an angle corresponding to about 2 o'clock and then it is maintained on a linear line with the pockets 3c of the winding wheel 3.

Then, each of the pockets 4c is oscillated from a position where each of the pockets 4c reaches predetermined spacing across the delivery position P3 opposing in a linear line to the pockets 5a of the folding wheel 5 to be described later, i.e. an angle corresponding to about 830 o'clock of the applying wheel 4 in the preferred embodiment and to an angle corresponding to about 9:30 o'clock and then each of the pockets 4c is maintained in a linear line with the pockets 5a of the folding wheel 5.

In addition, the relative position of the driven rollers $4d_3$ is moved, thereby the rotating shafts $4d_1$ are rotated, as each of the pockets 4c reaches a predetermined spacing across the delivery position P2 opposing on a linear line to the pockets 1 of the winding wheel 1, i.e an angle corresponding to about 1 o'clock of the applying wheel 4 and moves toward an angle corresponding to about 2 o'clock the pushers 4d are cooperatively operated in response to the projecting movement of the pushers 3c of the winding wheel 3, moved down while being abutted against the inner surface A2 of the box-like item A to be transported and thereafter each of the pockets 4c reaches a predetermined spacing across the delivery position P3 opposing in one line to the pockets 5 of the folding wheel 5 i.e. an angle corresponding to about 8 o'clock of the applying wheel 4 and moves toward an angle corresponding to about 10 o'clock and then the pushers 4d are projected.

Relative positions of the driven rollers $4e_5$, $4e_6$ are moved, thereby each of the hollow shafts $4e_3$ of the folding claws 4e1 and the rotating cylinders $4e_4$ of the folding pieces $4e_2$ is rotated, each of the pockets $4e_3$ reaches a predetermined angle position, i.e. an angle corresponding to about 1:30 o'clock of the applying wheel 4 in the preferred embodiment and moves toward an angle corresponding to about 2:30 o'clock, the folding claws $4e_1$ are moved to or away from in a counterclockwise direction, abutted against one free end B1 of the packaging sheet B and thereafter as it is moved toward an angle corresponding to about 3:30 o'clock, the folding claws $4e_1$ are moved away in a clockwise direction.

Concurrently, after each of the pockets 4c reaches a predetermined angular position i.e. an angle corresponding to about 1:30 of the applying wheel 4 in the preferred embodiment, it moves toward on angle corresponding to about 3:30 thereof, the folding pieces $4e_2$ are moved in clockwise direction while being delayed from a projecting speed of the folding claws 14, butted against the other free end B2 of the packaging sheet B, overlapped to the outside part of the one free end B1, thereafter it reaches an angle corresponding to about 6:00, the folding piece $4e_2$ are moved way in a counterclockwise direction.

Then, the folding pieces $4e_2$ are supported in a radial direction of the applying wheel 4 through the supporting shafts $4e_7$ pivotally supported at outer circumferences of the rotating cylinders $4e_4$ in such a way as they may be projected out or moved down, the sealing heaters 4g are integrally and cooperatively disposed so as to form the heating surfaces $4g_1$ at portions of the folding pieces $4e_2$ opposing to the outer surfaces A1 of the box-like items A transported into the pockets 4c and at

the sane time the driven rollers $4g_2$ are rotatably supported in opposition to the fixed cam $4f_6$ of the control cam 4f, and then there is provided a separating mechanism 4h for separating the heating surfaces $4g_1$ from the outer surfaces A1 of the box-like items A.

The fixed cam $4f_6$ of the control cam 4f is formed in an arcuate shape in opposition of the driving shaft 4a for the driven rollers $4g_2$ of the sealing heaters 4g, there is provided a resilient member $4g_3$ such as spring, for example for always abutting the driven rollers $4g_2$ against the fixed cam $4f_6$, the driven rollers $4g_2$ are moved along the fixed cam $4f_6$ as the driving shaft 4 is rotated, the heating surfaces $4g_1$ are controlled in their positions, and the heating surfaces $4g_1$ are pushed against the outer surfaces A1 of the box-like items A through the overlapping portions B3 of the packaging sheet B after each of the pockets 4c reaches a predetermined angular position with an angle corresponding to a part past about 3.30 o'clock of the applying wheel 4 in the preferred embodiment and reaches an angle corresponding to about 6:00 o'clock.

Separating mechanism 4h is operated such that it pulls away the heater surfaces $4g_1$ from the overlapped portions B3 a specified period of time after the heater surfaces $4g_1$ are started to be pushed against the overlapped portions B3 of the packaging sheet B without being related to a rotational speed of the applying wheel 4, wherein the separating mechanism is comprised of a sensing part $4h_1$ for sensing a rotational speed of the applying wheel 4, a timer part $4h_2$ operated in response to signal outputted from the sensing part $4h_1$ and a separating part $4h_3$ operated when the timer part $4h_2$ is timed up.

In the preferred embodiment of the present invention, the sensing part $4h_1$ of the separating mechanism 4h is constructed such that a rotational speed of the driving shaft 4a is electrically sensed by a rotary encoder or the like, for example, and when this sensed value is less than a set speed, a signal is newly outputted to the timer part $4h_2$, the timer $4h_2$ causes an air cylinder $4h_4$ to be extended in concurrent with a starting of pushing operation of the heater surfaces $4g_1$ in response to inputting of the signal, a moving cam $4h_5$ cooperatively arranged at the air cylinder $4h_4$ is projected toward the disk 4b of the applying wheel 4 and then only of the air timers $4h_5$ disposed in compliance with each of the heater surfaces $4g_1$ in the disk 4b where it is started to push against the outer surfaces A1 of the box-like items A after reaching the predetermined angular position is started to operate.

The separating part $4h_3$ causes the air cylinder $4h_7$ to be extended with air fed when the air timer $4h_6$ is timed up, the oscillating pieces $4h_8$ oscillatably supported in the supporting shafts $4e_7$ at the outer circumferences of the rotating cylinders $4e_4$ are oscillated toward the direction engaging with the folding pieces $4e_2$ and the heater surfaces $4g_1$ are pulled away from the outer surfaces A1 of the box-like items A.

The folding wheel 5 is placed near the downstream side of the applying wheel 4 and rotatably disposed in a vertical direction, wherein a plurality of inverse U-shaped pockets 5a as viewed from their front surfaces to which the box-like items A are fitted at the outer circumferences, twelve pockets, in the preferred embodiment, are equally spaced apart through planetary gear mechanism, they are continuously rotated in synchronous with a counterclockwise direction as viewed from their front sides in such a way as the rotational speeds of these pockets 5a are substantially the same as the rotational speeds of the pockets 4c of the applying wheel 4, and they are rotated while the relative positions of the pockets 5a are being kept horizontal without having any relation with the rotational positions of the folding wheel 5.

As shown in Fig. 1, a low speed conveyor 6 partially contacted with moving trucks of the pockets 5a and continuously and linearly moved at a slower speed than a forwarding or retracting speed of each of the pockets 5a, and a transferring passage 7 disposed in parallel with the low speed conveyor 6 and opposing against bottom surfaces A3 of the box-like items A are arranged above the folding wheel 5, thereby the box-like items A fed in an arcuate path upwardly under a continuous rotation of the folding wheel 5 are held between the holding claws 6a, 6a o the low speed conveyor 6 and the box-like items A are pulled out of within the pocket 5a rearwardly and at the same time a projection 5b of the subsequent pocket 5 follows up to fold rear flaps projected from right and left side surfaces A4, A4 of the box-like item A and subsequently th front flap as well as the upper and lower flaps are folded in sequence through the fixed guide disposed on the transferring passage 7 and then thermally adhered by the heater belt 8.

Then, operation of the packaging device described above will be described as follows.

Normally, the belt conveyors 1b, 1b positioned at an upstream side of the transporting conveyor 1 and the outer circumferences $1e_1$, $1e_1$ of the feeding rollers 1e, 1e are driven at the same speed, the intermediate belt conveyors 1c, 1c and the outer circumferences $1f_1$, $1f_1$ of the feeding rollers 1f, 1f are driven at a speed faster than the former speed and then the downstream end side belt conveyors 1d, 1d are driven at a speed faster than the latter speed.

Under this condition, the box-like items A are supplied from the item supplying source onto the transferring passage 1a while being in contact to each other and as both side surfaces A4, A4 of these box-like items A are abutted against the upstream side belt conveyors 1b, 1b the box-like items A are transported to the feeding rollers 1e, 1e while being contacted to each other as shown in Figs.2 and 3 under a driving operation of the upstream side belt conveyors 1b, 1b resulting in that as both side surfaces A4, A4 of the transported box-like item A are abutted against the outer circumferences $1e_1$, $1e_1$ of the feeding rollers 1e, 1e as shown in Fig. 4, they are fed out toward the downstream side, i.e. the intermediate belt conveyors 1c 1c as these outer circumferences $1e_1$, $1e_1$ are rotated.

Then, as the front part of the box-like item A is butted against the intermediate belt conveyors 1c, 1c in concurrent with an abutment of the rear part of the box-like item A against the outer circumferences $1e_1$, $1e_1$ of the feeding rollers 1e 1e, the box-like item A is accelerated toward a downstream side and pulled under a difference between the driving speeds of the outer circumferences $1e_1$, $1e_1$ of these feeding rollers 1e 1e and the driving speeds of the intermediate belt conveyors 1c, 1c, thereby the outer circumferences $1e_1$, $1e_1$ of the feeding rollers 1e, 1e are rotated idly in respect to the driving shafts $1e_2$, $1e_2$ under an operation of one-way clutches $1e_3$, $1e_3$.

Accordingly, there occurs no slip between the rear part of the box-like item A and the outer circumferences $1e_1$, $1e_1$ of the feeding rollers 1e, 1e and subsequently the item is fed to the feeding rollers 1f, 1f under driving speed of the intermediate belt conveyors 1c, 1c and then a predetermined spacing is opened between the box-like item A and its subsequent box-like item A.

Subsequently, as both side surfaces A4, A4 of the transported box-like item A are abutted against the outer circumferences $1f_1$, $1f_1$ of the feeding rollers 1f, 1f under a driving operation of the intermediate belt conveyors 1c, 1c, the item A is fed out toward the downstream side belt conveyors 1d 1d as these outer circumferences $1f_1$, $1f_1$ are rotated

Then as the front side of the box-like item A is abutted against the downstream side belt conveyors 1d, 1d in concurrent with the time in which the rear part of the box-like item A is abutted against the outer circumferences $1f_1$, $1f_1$ of the feeding rollers 1f, 1f the box-like item A is accelerated toward the downstream side and pulled under a relative speed difference between the outer circumferences $1f_1$, $1f_1$ of these feeding rollers 1f, 1f and the downstream side belt conveyors 1d, 1d, thereby the outer circumferences $1f_1$, 1f1 of the feeding rollers 1f, 1f are rotated idly in respect to the driving shafts $1f_2$, $1f_2$ under an operation of the one-way clutches $1f_3$, $1f_3$.

Accordingly, there occurs no slip between the rear part of the box-like item A and the outer circumferences $1f_1$, $1f_1$ of the feeding rollers 1f 1f, and subsequently the item A is transported toward the pusher conveyor 1i at a driving speed of the downstream side belt conveyors 1d, 1d and a spacing between the box-like item A and its subsequent box-like item A is further widely opened.

After this operation, the pusher plates 1i of the pusher conveyor 1i are raised substantially in a vertical state and projected out above the transferring passage 1a, advance into the clearance between each of the box-like items A and are abutted against the rear surface A2 of each of the box-like items A, thereby the pusher plates $1i_t$ is abutted against the box-like item A with more hardness when it is moved into the spacing between the box-like items A compared to the case that the pusher plates $1i_t$ are gradually raised from their slant states and projected onto the transferring passage 1a, and even if the spacing between the box-like items A is short, the pusher plates lit can be positively advanced and subsequently the box-like items A are transported while they are being equally spaced apart by the pusher plates $1i_t$.

Thus, as shown in Fig. 5, each of the holding claws 2g is rotated under a rotation of the transferring wheel 2 and as it is moved from the upper limit position of the transferring wheel 2 toward the downstream end of each of the transferring passages 1a, 1a spaced apart of the transporting conveyor 1 in a rightward or leftward direction, the mounting surfaces $2g_1$, $2g_1$ are oscillated in a counter-transporting direction around an upper end of the holding claw 2g under an operation of the control cm 2j and the claw is moved into between the box-like items A on the transferring passages 1a, 1a while being inclined.

After this operation, as the item A approaches the transferring passages 1a, 1a the mounting surfaces $2g_1$, $2g_1$ are oscillated around the upper end of the holding claw 2g in a transporting direction under an operation of the control cam 2j and abutted against the bottom surface A3 of the box-like item A while being in horizontal state, the box-like item A is held between the mounting surfaces $2g_1$, $2g_1$ and the holding guide 2i and temporarily fixed and the item is picked up on the mounting surfaces $2g_1$, $2g_1$ under a continuous rotation of the subsequent transferring wheel 2 and then the item is transferred upwardly while the item being kept in its horizontal state.

Thus, as the box-like item A placed on the mounting surfaces $2g_1$, $2g_1$ reaches a place near the delivery position P1 and occupies a linear line

with the pockets 3c of the winding wheel 3, the pushers 2h are projected and moved under an operation of the control cam 2j, the boxlike item A held between the mounting surfaces $2g_1$, $2g_1$ and the holding guide 2i is pushed out and then delivered to the pocket 3c.

After this operation, the box-like item A within each of the pockets 3c is transferred in an arcuate path under a continuous rotation of the winding wheel 3 and reaches near the sheet supplying mechanism 3 resulting in that the packaging sheet B supplied from the sheet supplying mechanism 3f is held to cover the opening of the pocket 3c, these box-like item A and the packaging sheet B are transferred in an arcuate path and they reach a position near the delivery position P2 and occupy a linear line with the pocket 4c of the applying wheel 4, resulting in that as shown in Fig. 12, the pusher 3d is projected out under an operation of the control cam 3g and the box-like item A is pushed out of the pocket 3c into the pocket 4c of the applying wheel 4.

In this case, the pusher 4d of the applying wheel 4 is moved down while being abutted through the central part of the packaging sheet B against the inner surface A2 of the box-like item A transported into the pocket 4d under an operation of the control cam 4f, and then the box-like item A is delivered while it is being held in forward or a rearward direction.

With such an arrangement as above, the packaging sheet B is struck against the opening edge of the pocket 4c and both free ends B1, B2 of the packaging sheet B are projected out of the pocket 12 in an outward direction in concurrent with folding into the U-shape along the upper and lower surfaces A3, A4 of the box-like item A.

Also subsequently, the pocket 4c having the box-like item A and the packaging sheet B transported therein is transferred in an arcuate path under a continuous rotation of the applying wheel 4, the folding claw $4e_1$ of the folding mechanism 4e is moved to the pocket under an operation of the control cam 4f to cause one free end B1 of the packaging sheet B to be folded along the outer surface A1 of the box-like item A, the folding piece $4e_2$ is slightly moved to the pocket in a delayed manner, the other free end B2 of the packaging sheet B is folded along the outer surface A1 of the box-like item A and overlapped on one free end B1 and at the same time the heater surface $4g_1$ of the sealing heater 4g is pushed against the overlapped portions B3 and the overlapped portions B3 are thermally adhered to each other.

In the case that the rotational speed of the applying wheel 4 is more than the set speed at this time, the separating mechanism 4h is not operated, but when the heater surface $4g_1$ reaches the predetermined angular position under an operation of the control cam 4f, it is moved away from the overlapped portions B3.

In addition, in the case that the rotational speed of the applying wheel 4 at this time is less then the set speed, the heater surface $4g_1$ is moved away from it at the time before the heater surface $4g_1$ reaches the separating position under an operation of the control cam 4f as shown in Fig. 13 after a specified period of time elapses after the separating mechanism 4h is operated to start to push the heater surface $4g_1$ against the overlapping portions B3 s shown in Fig.13.

After this operation, as the pocket 4c reaches near the delivering position P3 to occupy a linear line with the pocket 5a of the folding wheel 5, the pusher 4d is projected out under an operation of the control cam 4f as shown in Fig. 1, the box-like item A of which packaging film is completed is delivered from within the pocket 4c toward the pocket 5a of the folding wheel 5 and subsequently each of the flaps projected from the right and left side surfaces of the box-like item A is folded along the side surfaces and thermally adhered to each other.

In the aforesaid preferred embodiment, although the packaged cigarettes continuously supplied for every equal-spaced apart relation by the transporting conveyor 1 are picked up one by one as the box-like items A by the transferring wheel 2, transferred in an arcuate path upwardly while being kept at its horizontal state, and each of the box-like items A is transported from the transferring wheel 2 into the pockets 3c of the winding wheel 3, the present invention is not limited to this preferred embodiment and the packaged cigarettes A may be directly transported into the pockets 3c of the winding wheel 3 from the packaging machine set at a previous stage and further the box-like items A may be other products than the packaged cigarettes.

In addition, the configuration comprising the separating and supplying part of the transporting conveyor 1, the control cam 2j of the transferring wheel 2, the holding mechanism 3e of the winding wheel 3, the sheet supplying mechanisms 3f, the control cam 3g, the folding mechanism 4e of the applying wheel 4, the control cam 4f and the separating mechanism 4h and the subsequent stages at the downstream side from the applying wheel 4 are not limited to the aforesaid matter, but for example, as the separating add supplying part of the transporting conveyor 1, either two sets or four sets or more of the parallel belt conveyors opposing against the right and left side surfaces A4, A4 of the box-like items A may laterally be disposed in a linear manner and further a plurality of sets of parallel belt conveyors opposing against the upper

and lower surfaces of the box-like item A may be laterally disposed in a linear line under a similar operation o the system.

The present invention is constructed to have the configuration as described above and has the following advantages.

1. The box-like items transported into each of the pockets under a continuous rotation of the winding wheel are transferred in an arcuate path, the packaging sheet supplied from the sheet supplying mechanism is held by the holding mechanism so as to cover the openings of the pockets during this arcuate transferring operation, thereafter the pockets reach a portion near the delivering position and each of the pockets of the winding wheel and the pockets of the opposing applying wheel is oscillated and thereby both these pockets are maintained on a linear line and at the same time the pushers are projected to deliver the box-like items into the pockets in the applying wheel, resulting in that the compact winding means capable of being transported at a high speed can be disposed at a downstream side of the winding wheel.

Accordingly, as compared with the prior art system in which the annular chain conveyor is curved over predetermined segment of the outer circumference of the winding wheel and the annular heater belt is wound in n annular form over the predetermined segment at the outside part of the chain conveyor, a diameter of the applying wheel positioned at the downstream side is not increased more than the diameter of the winding wheel is, resulting in that the entire device can be made small and the winding wheel can be rotated at a high speed and the processing sped is made first to enable a large amount of packaging to be carried out within a short period of time.

2. Each of the pockets of the applying wheel is provided with the folding mechanism for folding both free ends of the packaging sheet projected out of the pockets along the outer surface of the box-like item and with the sealing heater to be in contact with the overlapped portions of the folded packaging sheet and to thermally adhere them, resulting in that the entire device can be made compact as compared with that of the prior art system in which the annular heater belt is projected and disposed.

3. Each of the pockets having the box-like items transported therein as the applying wheel is continuously rotated is transferred in an arcuate path, the folding mechanism and the sealing heater are operated when the pockets reach the predetermined angular positions, thereby both free ends of the packaging sheet projected out of the pockets outwardly are folded along the outer surface of the box-like item and overlapped to each other, they are in contact with the sealing heater, the sealing heater is in contact with the overlapped portions only for a specified period of time under an operation of the separating mechanism resulting in that the contact time between the overlapped portions and the sealing heater can be kept constant without having any relation with the variation in rotational speed of the winding wheel.

Accordingly, as compared with the prior art system in which the contact time between the overlapped portions and the heater belt is proportional with the moving speed of the chain conveyor, no seizure may occur even if the rotational speed of the winding wheel is made slower than its normal rotational speed during an energization of the device or a low speed operation, for example, and further the contact time between the overlapped portions and the sealing heater can be adapted for the speed difference even if the rotational speed of the winding wheel is made fast.

Claims

1. A packaging device in which a thermoplastic packaging sheet is supplied to a peripheral part of an opening of a pocket of a winding wheel while box-like item transported into the pocket is being continuously transferred, the box-like item is transported out of the pocket and delivered thereby the packaging sheet is wound in a U-shape along the surface of the box-like item, and both free ends of the packaging sheet are folded along the surface of the box-like item while the delivered box-like item being continuously transferred and then overlapped to each other to be thermally adhered to each other, characterized in that an applying wheel continuously rotated synchronously in a direction opposite to a rotating direction of said winding wheel is disposed in parallel on a downstream side of said winding wheel, each of an outer circumference of the winding wheel add an outer circumference of the applying wheel is provided with a plurality of pockets having the box-like items transported therein is equal-spaced part in a rotational direction and oscillatably, the winding wheel and the applying wheel are continuously rotated in synchronous manner in an opposite direction to each other, both pockets are kept on a linear line over predetermined segment across the delivery position where the pocket in the winding wheel and the pocket in the applying wheel are opposite to each other in a linear line, pushers for pushing the box-like items in the pockets of the winding wheel into the pockets of the ap-

plying wheel are disposed in such a way as they may be moved out or down, a sheet supplying mechanism for supplying the packaging sheet to the outer circumference of the winding wheel is provided and a holding mechanism for temporarily holding the packaging sheet around the opening of the pocket of the winding wheel is provided.

2. A packaging device s set forth in Claim 1 in which when each of the pockets in the winding wheel and each of the pockets of the applying wheel reach predetermined angular position, each of the pockets of the winding wheel and each of the pockets of the applying wheel are oscillated and a control cam for moving out or down the pushers is fixed and disposed.

3. A packaging device as set forth in Claim 1 in which each of the pockets of the applying wheel is provided with a folding mechanism for folding both free ends of the packaging sheet projected ou of the pocket along an outer surface of the box-like item and a sealing heater to be contacted with the overlapped portions of the folded packaging sheet for thermally adhering them to each others.

4. A packaging device in which a thermoplastic packaging sheet is supplied to a peripheral part of an opening of a pocket of a winding wheel while box-like item transported into the pocket is being continuously transferred, the box-like item is transported out of the pocket and delivered, thereby the packaging sheet is wound in a U-shape along the surface of the box-like item, and both free ends of the packaging sheet are folded along the surface of the box-like item while the delivered box-like item being continuously transferred and then overlapped to each other to be thermally adhered to each other the outer, circumference of said winding wheel and the outer circumference of the applying wheel disposed near and in parallel with said winding wheel are provided with a plurality of pockets having box-like items transported therein equally spaced apart, these winding wheel and applying wheel are continuously rotated in an opposite direction from each other in synchronous manner, each of the pockets of the winding wheel is provided with a folding mechanism for folding both free ends of the packaging sheet projected out of the pocket along the outer surface of the box-like item and overlapping them to each other and a sealing heater to be contacted with the overlapped portions of the folded packaging sheet and thermally heated to adhere them and there is provided a separating mechanism for separating the sealing heater from the overlapped portions after a specified period of time elapses from a contact starting with the sealing heater and the overlapped portions of the packaging sheet.

5. A packaging device as set forth in Claim 4 in which the folding mechanism has folding claws and folding pieces having the sealing heater cooperatively disposed which are disposed in opposition to the outer surface of the box-like item in such a way as they may be moved to or away from each other, the folding claws are moved to or away from it when each of the pockets reaches a predetermined angular position and at the same time the control cam for moving the folding pieces having the sealing heater cooperated to move to or away from it with a delay from the moving to or way from it and or separating them to each other is provided.

6. A packaging device s set forth in Claim 1) or 4) in which the transferring wheel continuously rotating in synchronous with a direction opposite to rotating direction of said winding wheel is disposed in parallel on an upstream side of the winding wheel, and the outer circumference of the transferring wheel is provided with an oscillatable mounting surface for picking up the box-like item supplied continuously in equal spaced apart relation with a transporting conveyor at a lower part of said transferring wheel and with a plurality of pushers equally spaced apart to be projected out or moved down for pushing the box-like item on the mounting surface and transporting it into the pocket of the winding wheel.

7. A packaging device as set forth in Claim 6 in which each of the mounting surfaces of the transferring wheel is oscillated as it approaches a transporting truck of the transporting conveyor and oscillated in an opposite direction when it passes through said transporting truck and it is kept horizontal until it reaches a delivering position with the pockets of the winding wheel and at the same time a control cam for moving out or moving down the pushers when it reaches the delivery position is fixed and disposed.

8. A packaging device as set forth in Claim 7 in which there is provided a separating and supplying part for making a driving speed at a downstream side from a midway part of the transporting conveyor faster then driving speed

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 0357

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-2 195 314 (G.D.) * page 1, line 103 - page 2, line 105; figures *	1	B65B11/30 B65B19/22
Y		2,3,4,5	
Y	GB-A-2 164 913 (VEB KOMBINAT NAGEMA) * page 2, line 21 - page 3, line 73; figures *	2,3	
Y	GB-A-2 206 327 (G.D.) * page 6, line 7 - page 8, line 12; figures *	4,5	
A	GB-A-2 003 817 (FOCKE) * page 1, line 128 - page 2, line 74; figures *	4,5	
A	GB-A-1 086 180 (MOLINS)		
A	EP-A-0 030 359 (FOCKE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 MAY 1993	JAGUSIAK A.H.G.

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